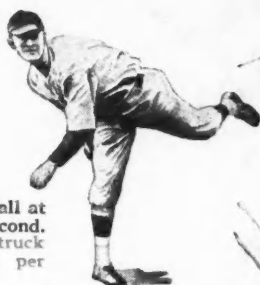


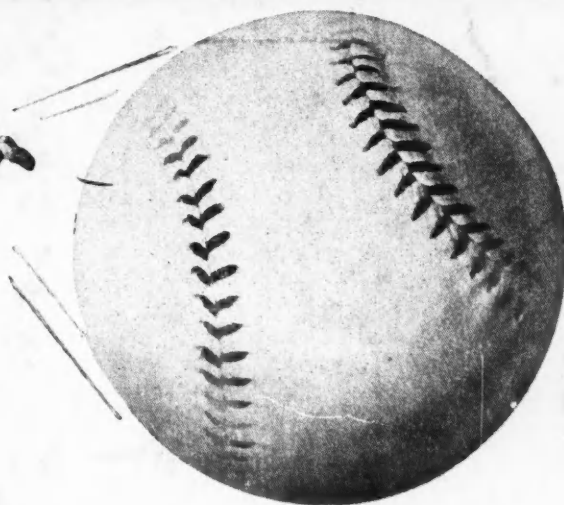
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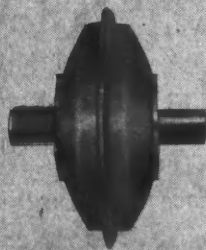
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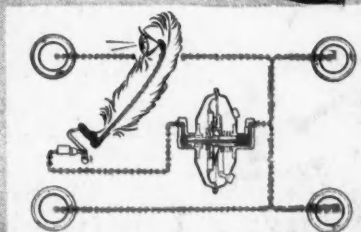
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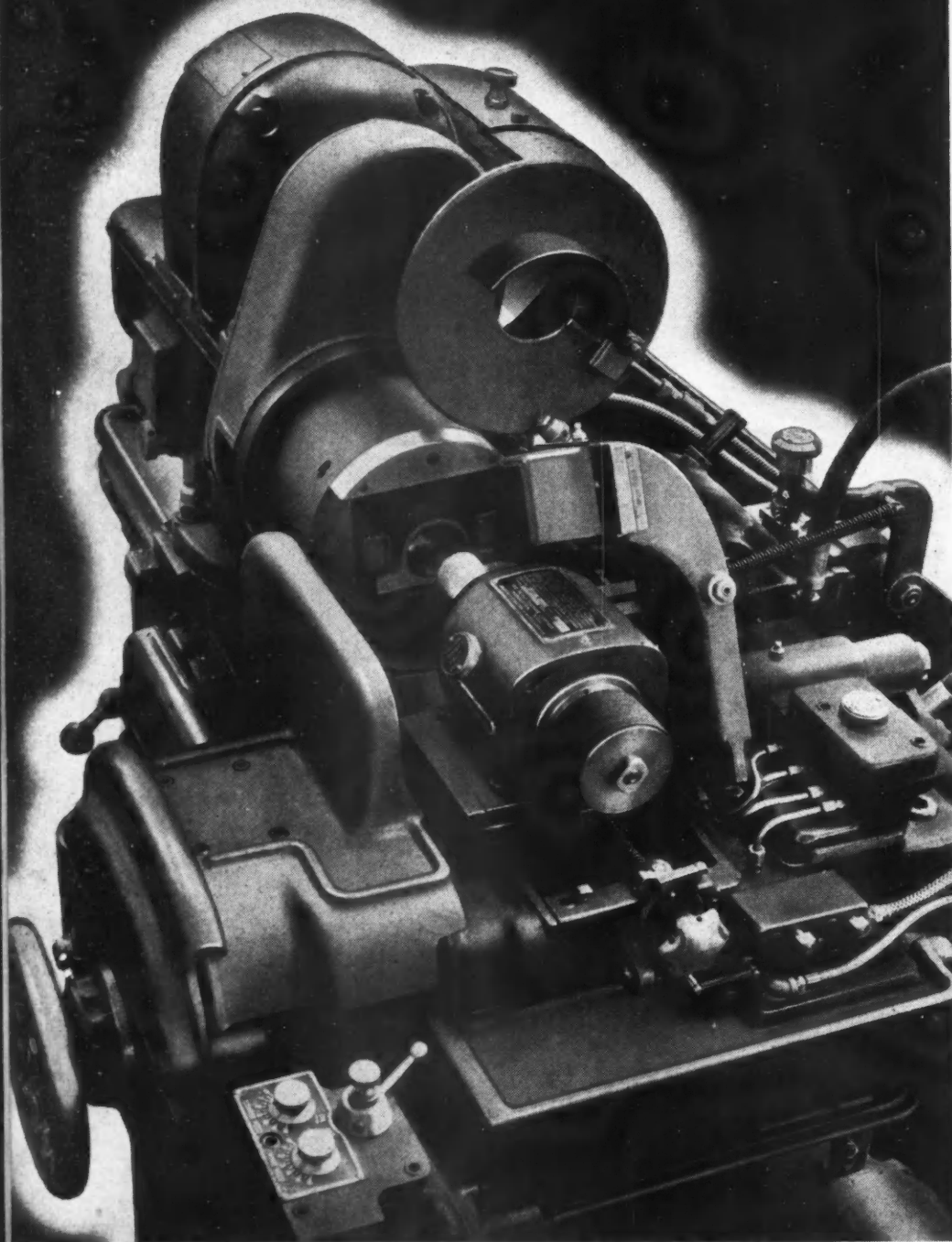
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AUTOMOTIVE and Aviation INDUSTRIES

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April 15, 1946

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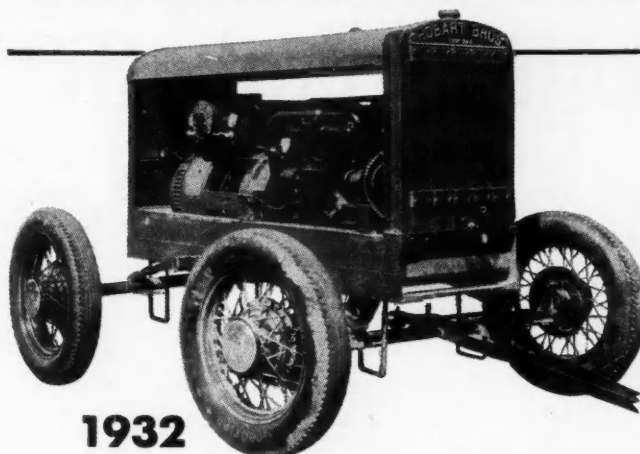
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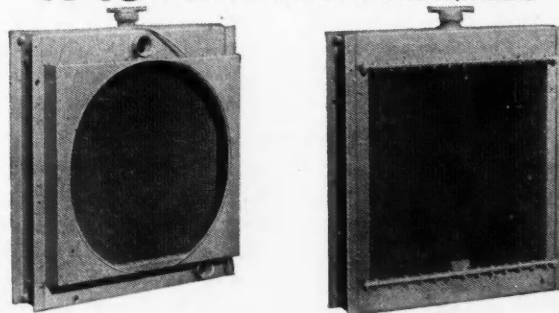
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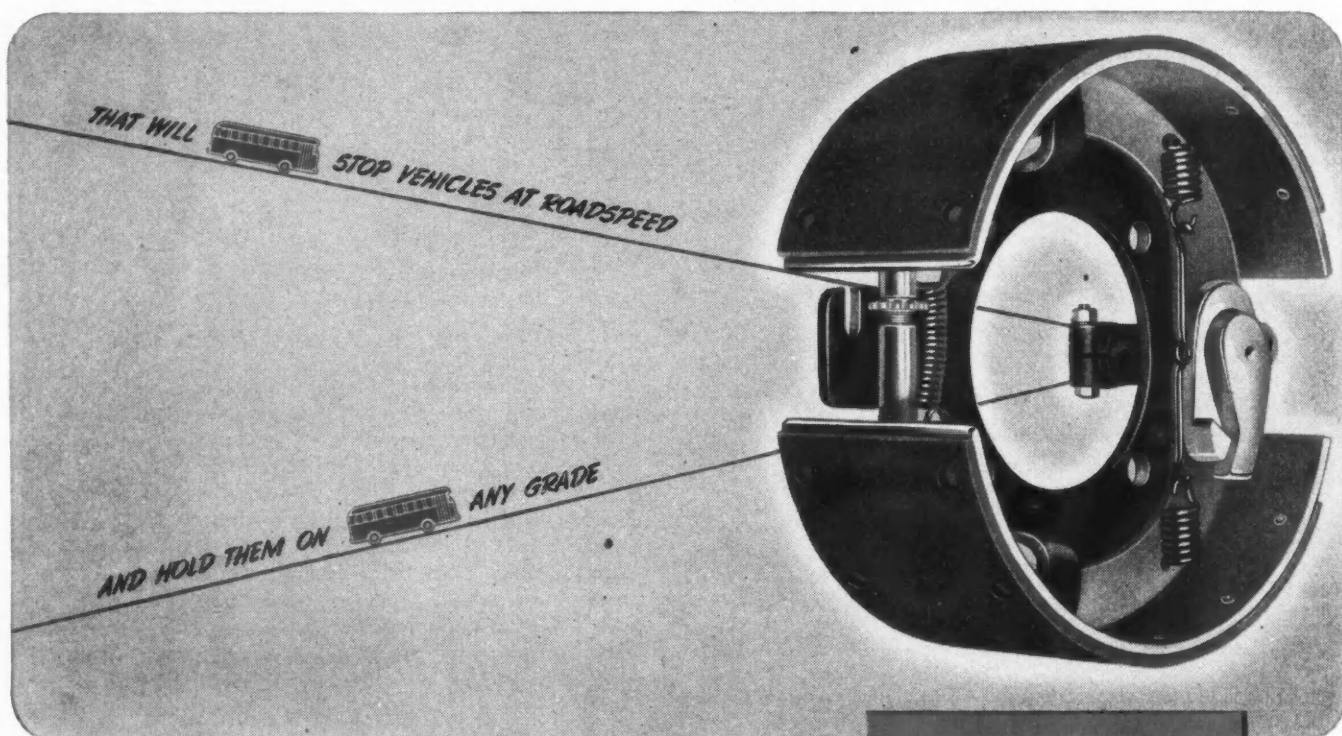
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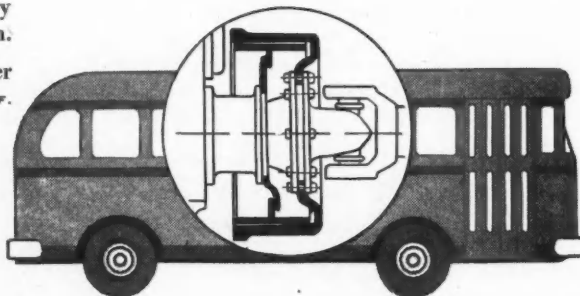
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Production and Price Control

By J. Howard Pew

President, Sun Oil Co.

WHEN hostilities ceased, our national requirements changed. Our postwar objective overnight became the production of consumer goods in sufficient volume to give our people those things for which they had fought the war—homes and a better standard of living for everyone. Removal of road blocks erected against civilian production became imperative. The needs of our people demanded the restoration of a freely functioning market, historically the most effective stimulant of production in peacetime.

Thus ended all justification for price control. Along with other wartime controls, it should have been thrown overboard as quickly as administratively possible. Had this been done last fall, supply and demand in all industries now would be rapidly on their way to a point of balance. Instead, supply and demand have become more unbalanced and our people go without the things they want and need.

The avowed reason we have not abandoned price control is a specious argument that price increases cause inflation. . . . Price increases no more cause inflation than wet streets cause rain. Wet streets are a result of rain and rising prices are one of the many disastrous results that follow in the wake of inflation.

Inflation results when there has been an expansion in purchasing power that is not matched by a comparable expansion in the production of real consumer goods and services. We have an inflationary condition today as a result of the monetizing of the Federal debt, and war accumulated shortages in certain consumer goods, aggravated by OPA controls. The best and the only effective ways to halt this inflationary trend are to balance the Federal Budget at the earliest possible date and to stimulate the production of goods.

All this OPA talk about industry promoting scarcities is bunk. The life blood of industry is abundant production and nothing would suit industry better than a peacetime level of production equal to that achieved in the war. There is no doubt, if the hobbles are removed, that industry can produce all the goods the public needs. The expansion of manufacturing production in 1940-44 is proof of that.

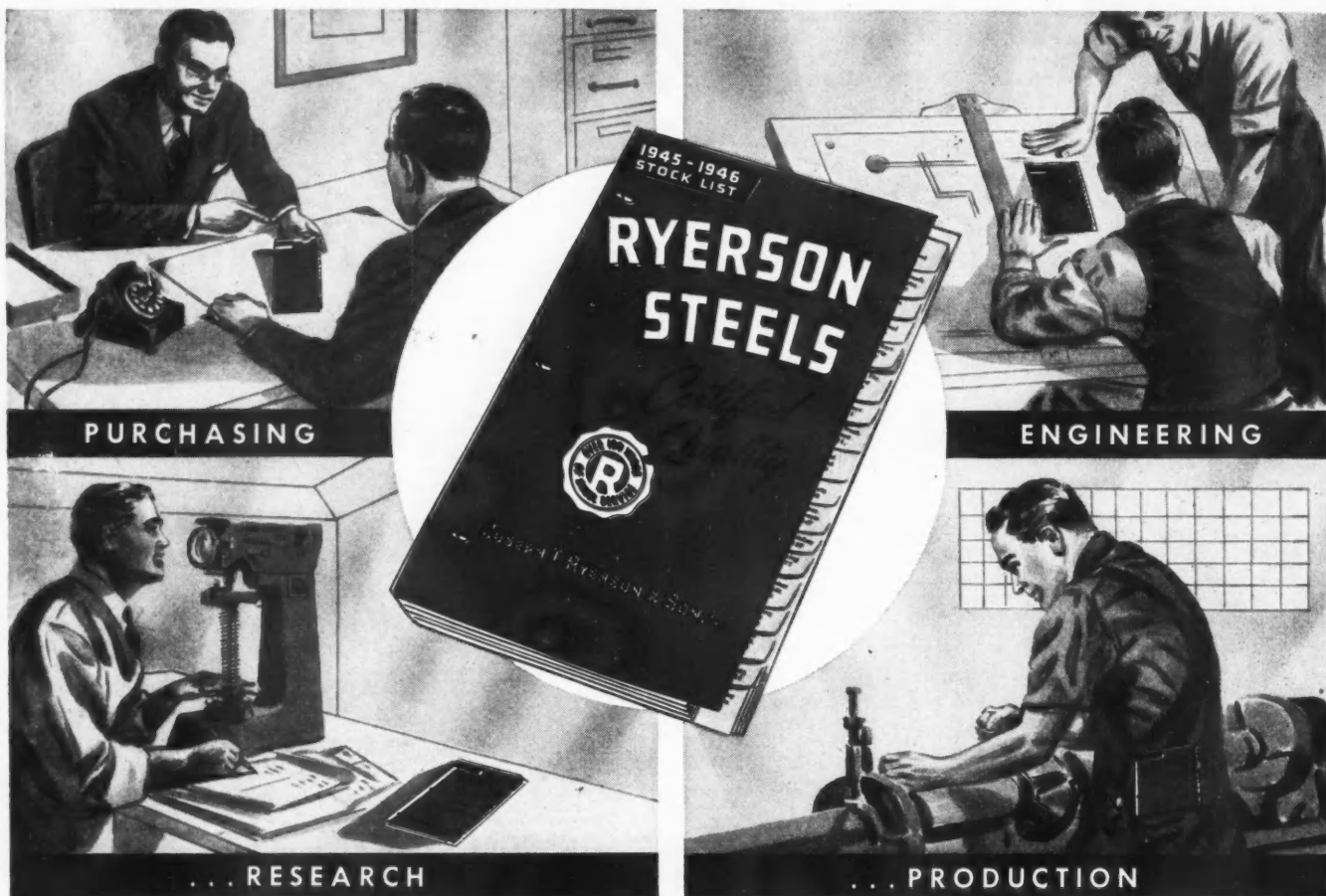
Taking 1939 as representing 100, the Federal Reserve Board Index of Manufacturing Production was 231 for 1944. . . . The War Production Board last year asserted: "It is especially remarkable that notwithstanding the massive shift of industrial resources to munitions production, the manufacturing industries managed to supply the civilian market throughout the war with about as much finished goods as in 1939, though somewhat less than in 1941."

Price control and labor strikes primarily have been responsible for the failure to produce the consumer goods needed—and price control in large measure has been responsible for the strikes. Had industrial management been free to adjust prices and wages, and if the Government had not interfered, increased wage demands would have been reconciled without the lengthy strikes which have been so costly to everyone.

(Turn to page 70, please)

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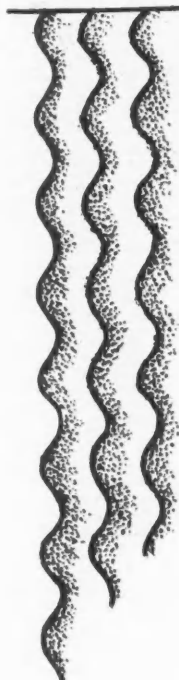
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RYERSON STEEL



Five Year Plan Ineffective with French Automobile Industry

By

W. F. Bradley

Special Correspondent of
AUTOMOTIVE AND AVIATION
INDUSTRIES in France

INAUGURATED in July 1945, with a preliminary period dating from October 1st, 1944, the French Five-Year Plan drawn up by Engineer Pons has not given the results expected of it, and already it is reported that another plan is being prepared by Jean Monneret and that a third is being studied by the C.G.T. (a Labor Confederation with Communistic tendencies).

The Pons plan was ambitious, for under it 1,701,300 motor vehicles (trucks and passenger cars) were to be produced in five years, and by the second year the country was to attain its maximum prewar production, and to largely exceed it during the third, fourth and fifth years. France reached her peak in 1930, with the production of 265,000 vehicles. The Pons plan sets a figure of 246,850 for the second year (ending July 1st, 1947), and estimates for the three following years were 344,500, 430,700, and 480,700. The emphasis is put on trucks for the first two years, and then gradually transferred to passenger cars. During 1945 only 32,741 utility vehicles were produced, compared with the 80,000 estimated under the plan.

Prominent among the reasons for the set-back is lack of current which has made it impossible for the factories to operate more than three days a week. Coal, coke, sheet steel, forgings, tires and other materials or finished articles are all so short that the movement cannot get into its swing.

The plan provides for a grouping of the factories.

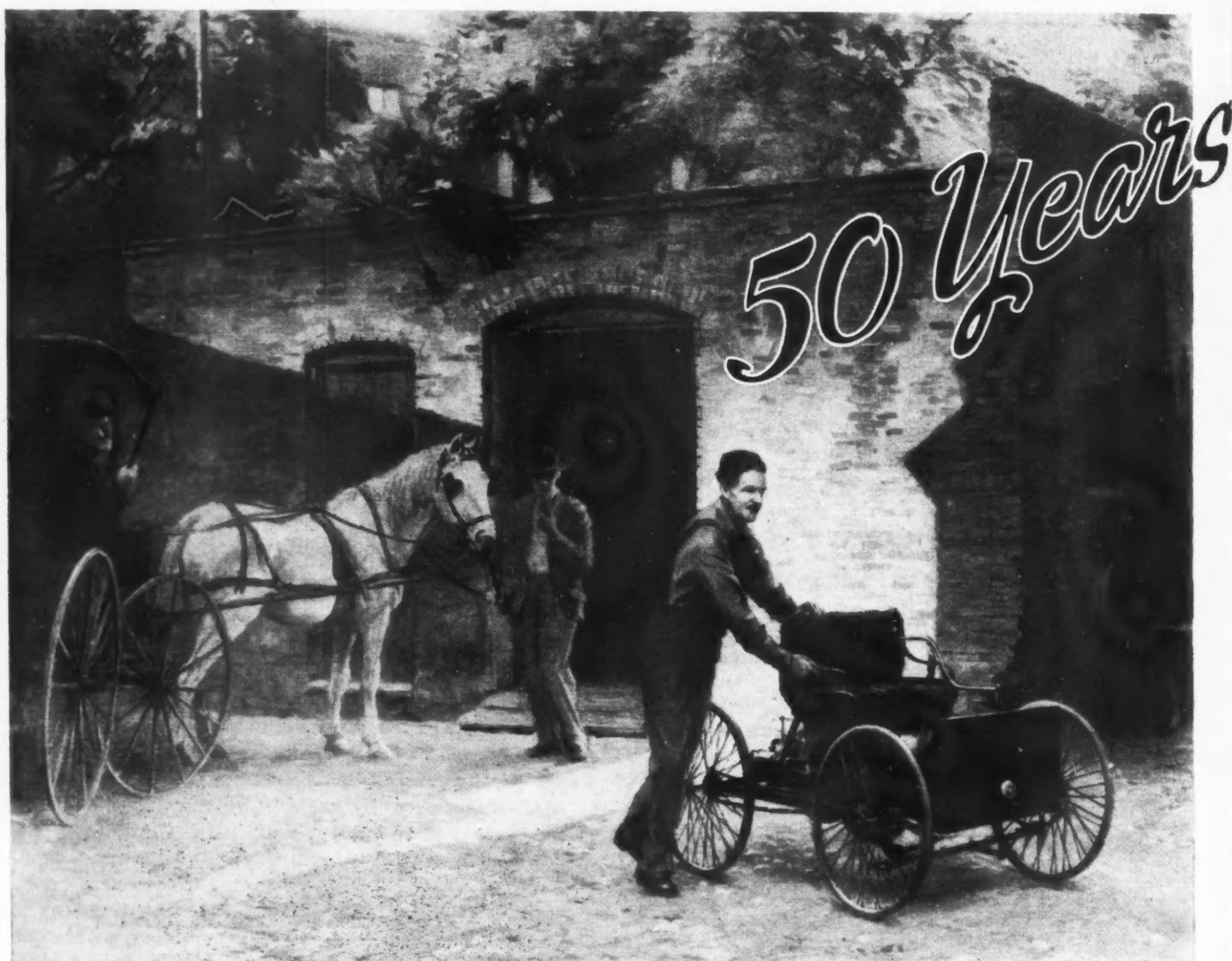
Renault, Citroen and Ford remain as units. Peugeot has been placed at the head of a group to which Saurer, Hotchkiss and Latil are added. Berliet, which probably will be nationalized, links with Rochet-Schneider, also at Lyons. A sixth group, often referred to as the French General Motors, comprises Panhard, Simca (French Fiat), Delahaye, and the truck makers—Bernard, Laffly, Somua and Willeme.

Except where there is financial control, this grouping does not appear to be very effective. In the Peugeot group, for instance, Saurer, being a Swiss firm, does not appear inclined to take second place to the others. Latil was owned by Charles Blum, who sold out at the beginning of the war and died in New York. The family, however, has regained possession and intends to be independent. Hotchkiss contests Peugeot's domination on the strength of holding 12½ per cent of the shares. Grouping might come from within, although the individualistic French have made little progress in this direction, but it cannot come by Government order.

As the truck situation is eased, manufacturers will be allowed to turn to passenger cars, the types of which are clearly determined. Attention is given to a low-weight, low-powered popular car, of which two models are mentioned in the plan—the front drive, two-cylinder engined Gregoire car (see Jan. 15 issue of *AUTOMOTIVE AND AVIATION INDUSTRIES*) to be built by Simca and Panhard, and a four-cylinder rear engined car by Renault. In reality there are 10 different cars of this type, and it remains to be seen if the others will be satisfied to let two types monopolize the market.

The Pons report paints a somber picture of the machine equipment of the French factories. In 1942 the average age of the 60,400 machine tools used for automobile construction was 18 years. It is now 22 years. The average age of milling machines and gear cutters is more than 21 years. The three big manufacturers, Citroen, Renault and Peugeot, representing two-thirds of the industry, total 41,000 machines, having an average age of 19 years. Some firms, such as Berliet and Panhard, modernized their factory equipment at the end of World War No. 1, and have not added to it since. Forty-six per cent of the factory equipment is of foreign origin.

(Turn to page 70, please)



DETROIT this year is celebrating fifty years of progress in the automobile industry with a colorful Golden Jubilee for which the dates May 31 to June 1 have been selected. It will be a double celebration, one to honor the automobile pioneers and the other to mark the progress, during the past half century, of both the industry and the city.

It is impossible to fix on any definite date which can be said authentically to be the one on which the industry was born. The selection of the year 1896 when Henry Ford and Charles B. King publicly drove cars of their own making on the streets of Detroit will serve well enough, therefore, as a mark from which to count off the years for celebration purposes. Just in passing, however, it may be noted that according to the records of the Ford Motor Co., Mr. Ford made his initial run some years earlier than that. The early history of the development of the automobile is at best somewhat cloudy and obscure. There are records of vehicles propelled by steam having been driven on public roads in various sections of the country as far back as 1863. There may have been others, of one type or another, before that. There were gasoline cars, too, that were publicly demonstrated and extensively

From such beginnings in such settings a giant industry struggled into being. In this artist's conception of a critical moment in the life of the young Henry Ford, there is recorded imperishably the atmosphere of the pre-motor days of the "Nineties." The locus is the entrance to Ford's Bagley Avenue shop where he built his first automobile beginning in 1893.

used before 1896. But what does it matter?

In the final decade of the 19th century inventive mechanics here and there turned largely to the internal combustion engine as a source of power for their horseless carriages. By 1895 the developing industry had attained such definite embryonic shape that a national magazine, *The Horseless Age*, was brought out by a far-seeing publisher as an aid in fostering its growth. In the first issue, more than a dozen self-propelled vehicles which had recently been built and run were described and illustrated by actual photographs. The word actual is used advisedly. There were also descriptions of even a larger number of motor vehicles that were then in various stages of development. That magazine, the first automobile journal printed in the English language, was, twenty-three years after its first appearance merged with *AUTOMOTIVE AND AVIATION INDUSTRIES*.

At Least

By
Julian
Chase

Let's Celebrate

The sponsors of Detroit's Golden Jubilee are wise in their selection of the time and form of celebration. To give due credit to all the real pioneers in the field of automobile building would be a noble undertaking but one too vast in scope and too heavily fraught with the hazard of unjust omission to be seriously considered. So this is Detroit's day and Detroit has a valid reason for celebrating. Fifty years ago, at least, two of its native sons drove on its streets their home-made horseless carriages. Furthermore, it is the center of the zone in which are the homes of the country's oldest continuous manufacturers of passenger cars. With it, inseparably associated, are the names of Ford, Packard and Olds.

In the very early days, makers of horseless carriages sprang up like mushrooms in many widely separated places throughout the country. Detroit, then, was just another pleasant city with no more than its modest share of enterprising and motor-minded mechanics. But, with the turn of the century, the speculative spirit of many of its moneyed citizens was stimulatingly affected by the bite of the automobile bug. Companies were rapidly organized to manufacture the means of transportation for which the coming era called. There followed, somewhat later, a period of boom and bust, but for eight years there was a steady growth in the number of automobile manufacturing companies whose address was F.O.B. Detroit. By 1903 there were eleven and in 1908 there were twenty-three of them, and that

seems to have been the high-water mark. There were others also at that time within the territory near Detroit, in what is now regarded as the Detroit zone.

The three makes of passenger cars manufactured today whose roots go deepest into recorded automobile history are the Ford, the Oldsmobile and the Packard. Henry Ford started to build his first car in a little shop on Bagley Avenue in 1893. His first attempts at organizing for manufacture were far from

(Turn to page 90, please)

PROPHETIC WISDOM

THOSE who have taken the pains to search below the surface for the great tendencies of the age, know what a giant industry is struggling into being there. All signs point to the motor vehicle as the necessary sequence of methods of locomotion already established and approved. The growing needs of our civilization demand it; the public believe in it, and await with lively interest its practical application to the daily business of the world.—From an editorial in The Horseless Age, November, 1895.



Fifty Years Ago—Charles B. King in the horseless carriage which he drove on the streets of Detroit in 1896.

ALTHOUGH the precision casting process or "lost-wax" process as it has been frequently called was widely used during the war in making parts for military equipment, the details of the process were restricted from publication until recently. It is rather interesting to find that scores of companies were engaged in this work, employing a number of different techniques depending upon the character of the parts and the kind of material from which they were made. Generally speaking, the producers of non-ferrous parts relied upon the simple methods stemming from dental and jewelry trade practice while those making parts from ferrous metals or hard metal compositions developed special techniques better suited to such materials.

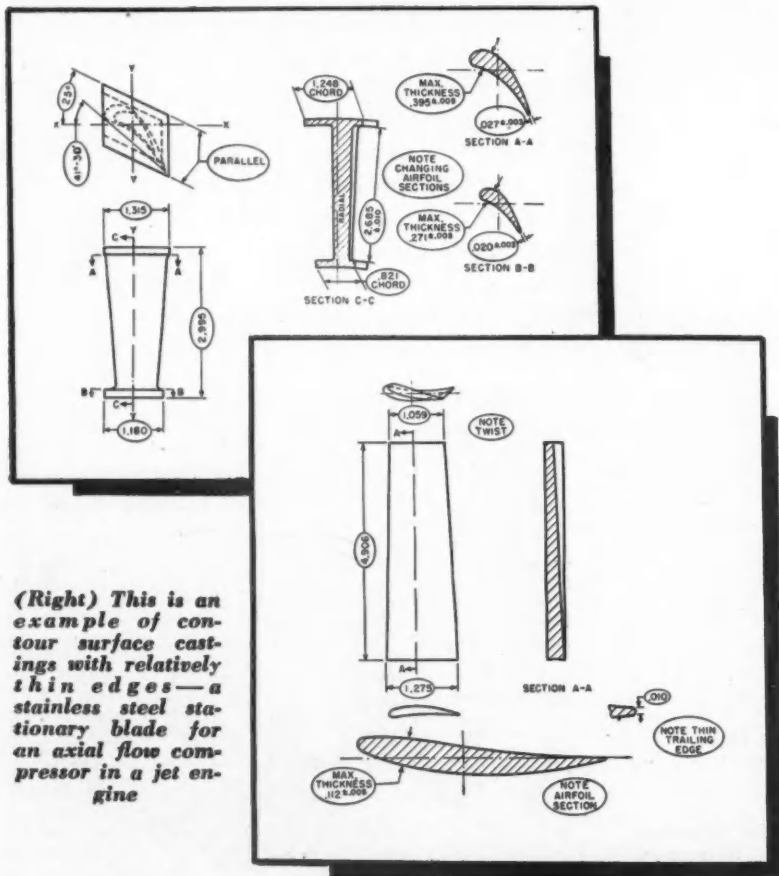
Precision Casting

By Joseph Geschelin



Fig. 1—Dies for wax patterns are assembled with such cores as are needed and are placed in power-clamped fixtures such as the one shown here. The pressure gun held by the operator is filled with molten wax from a nearby pot, inserted in the die and emptied into the cavity by means of the pneumatic ram at the right

(Below) A more intricate casting is this nozzle vane segment made of Haynes Stellite No. 21, a true airfoil element



(Right) This is an example of contour surface castings with relatively thin edges—a stainless steel stationary blade for an axial flow compressor in a jet engine

This article is concerned with precision castings made by Haynes-Stellite Co., and describes the methods and equipment found in its new plant at Kokomo, Ind. Disclosure of these details was made during a recent editorial conference held in Kokomo.

Before describing the plant setup, it is important to note that the precision casting process has definite advantages as well as limitations. Among the advantages we can list the following:

1. Production of castings from alloys difficult to work or fabricate by conventional methods. This is particularly true of Haynes Stellite and Hastelloy alloys which have exceptionally high hardness and tensile strength at elevated temperatures.
2. Intricate shapes, contours, thin edges—such as for airfoil sections of gas turbine parts can be produced consistently by this process. It is also feasible to incorporate threads, shoulders, cored holes, and decorative surface design.
3. Advanced design of product can be effected because parts can be designed to meet specific performance requirements without considering the limitations of fabrication.

Methods and Equipment

*at New Kokomo Plant
of Haynes-Stellite*

Fig. 2—Here the operator is seen removing a wax pattern from the mold. Cores are removed at this point and the wax gate is broken off by hand



4. Smoother, cleaner surfaces are possible and parts can be held to close tolerances—plus or minus 0.003 in. on small castings.

5. Maximum interchangeability of parts is guaranteed since precision castings are uniform in quality, size, contour, and finish.

6. Improved metallurgical properties and dense, sound castings are said to result from this method. The cast structure is said to be conducive to long life of stressed parts operating at high temperatures.

The alloys used by Haynes include — Haynes - Stellite cobalt-base alloys, Hastelloy nickel-base alloys, Hascrome iron-base compositions, high temperature alloys, and stainless steels.

Typical of the parts which have been produced economically by the Haynes process are the following—turbo-supercharger buckets, parts for aviation carburetors,

parts for Diesel engines including pre-combustion chamber cups, cut-off neck rings for glass molds, turbine blades—solid and hollow, gas turbine compressor blades, gages, bushings, injector nozzles, valves, nozzle diaphragm blades, etc. Largest part made recently is a three-lb propeller hub for the Ercoupe airplane. In mass production, the heaviest part made thus far is a 1 1/3-lb coupling used in a Pratt & Whitney engine.



Fig. 3—View of the conveyerized bench assembly line. The individual wax patterns are inspected, then assembled in groups to gates, risers, etc., by "wax welding," and mounted on special wax hubs

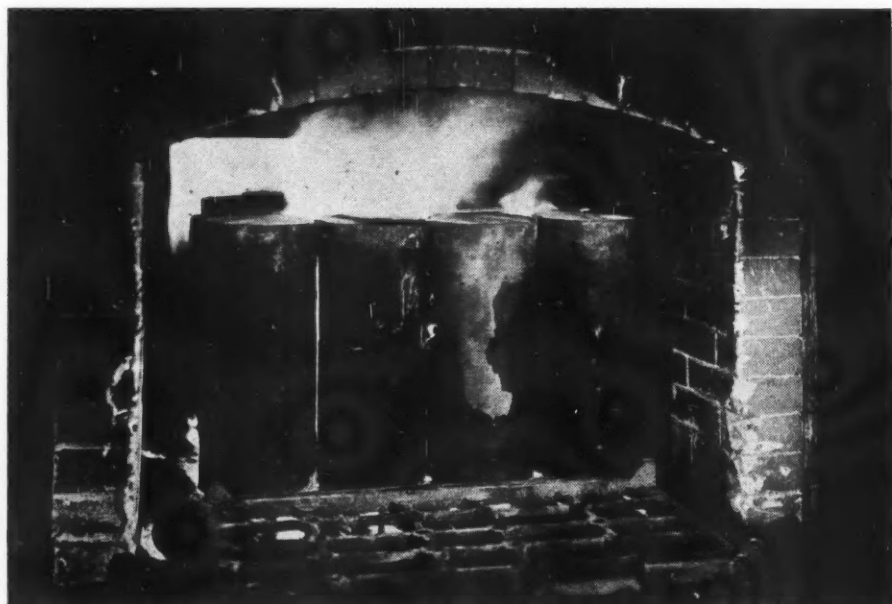


Fig. 4—Following "stuccoing" and drying in the dehumidifying tunnel, the wax patterns are nested in flasks of Hastelloy C alloy with the steel base plate waxed to the flask for tightness. As seen here, the flask has been enveloped with wax paper longer than the flask to provide space for excess investment

The company is gradually getting into the production of heavier castings and soon expects to produce parts weighing from three to five pounds. However, the present design of pressure casting furnaces restricts maximum weight to five pounds.

Coming to the details of the process, the first step is the preparation of the wax which is carefully blended from raw materials and molded into blocks. The blocks are removed from the molds for storing, later are

Fig. 5—Following the steps described in the text the molds are placed in upside-down position in the furnace and heated for several hours, the wax being burned out in the initial hot zones



melted as needed for loading into pressure guns.

Meanwhile, the tool room makes up one or more master patterns from the customer's drawing of the part, these being fabricated from brass, steel, Haynes Stellite, wood, or other material depending upon the design of the part. The pattern is made slightly oversize to allow for shrinkage, about $1\frac{1}{2}$ per cent on the average. This master pattern is used for making the injection dies in which the wax is cast, the dies being a negative of the master pattern. Generally the dies contain from one to twenty cavities, the largest number of cavities being preferred in the interest of economy.

In production, the die is assembled with the necessary cores by an operator, and placed into a special power-clamped fixture, Fig. 1. At the side of the press are wax melting pots held under accurate temperature control. The operator fills the pressure gun from the wax pot, inserts the gun into the sprue opening of the die, and starts the pneumatic ram which empties the contents of the gun into the die. The die is removed from the press and disassembled to remove the wax pattern as shown in Fig. 2. At the same time the operator removes the cores and breaks off the wax gate.

The wax patterns, as they are produced on the various presses, are transported down a conveyORIZED assembly line, Fig. 3. Here they are inspected and assembled by skilled operators into pattern assemblies together with gates and risers by "wax welding." At the end of the assembly line the patterns are ready for preparation for investment in flasks. The first step is to dip each pattern assembly in a very fine silica suspended in a suitable liquid bath. This coats the entire pattern and provides the smooth, heat resistant mold surface for the casting after the wax has been melted out. After the excess liquid has run off, the casting is coated or "stuccoed" with somewhat coarser silica grains which are dusted on.

The pouring mouth of the assembly is sealed to a steel plate, the latter also being sprayed with the silica coating. Then the "stuccoed" assembly on the



Fig. 6—In the alloy melting department—when the indirect fired electric melting furnace reaches proper temperature, the operator places the hot mold over the pouring spout of the furnace, clamps it firmly in place, then inverts the entire assembly for pouring

plate is carried through a long dehumidifying tunnel on a belt conveyor. This cycle takes 22 minutes. At the end of the tunnel the wax assemblies are removed and assembled within a flask or tube of Hastelloy C which is sealed to the steel base plate with wax to assure liquid tightness. The flask is encased in wax paper, Fig. 4, built up much longer than the flask to hold an excess of investment material.

Next the flask is transported to the adjacent department where it is filled with the investment material. Unlike the process in making nonferrous parts, the investment material is not of a plaster-of-Paris base. The mixture consists of carefully measured parts of silica flour, silica sand, bonding sand, grog, and ethyl silicate, producing a chemically hardening silica gel. After the flask has been filled with the investment mixture, it is placed on a vibrator or shaker table whose function is to pack the material tightly around the wax assembly and to void entrapped air. It takes about an hour for the investment to set with the fines segregated at the top section of the flask. The excess investment is cut off on a power saw and the mold permitted to age for several hours. Then the steel base plate is removed, exposing the pouring mouth of the mold.

As shown in Fig. 5, the molds are placed upside down in a continuous furnace provided with graded heating zones, the molds being heated at a temperature ranging from 1300 to 1900 F depending upon the type of work. During this cycle, running several hours, the wax is first burned out in the hotter zones of the furnace, the molds continuing through to the end of the cycle. Note that none of the wax is recovered in the Haynes process.

Meanwhile the raw materials for the alloy to be cast in the mold are prepared in the electric furnace section located near the discharge end of the furnaces. Here the alloy is melted in electric furnaces and cast into pigs for use in the indirect arc melting furnaces from which the molds are filled. When the metal in

the melting furnace reaches its correct temperature, as measured by an optical pyrometer, the hot mold is inverted and placed directly over the pouring spout as shown in Fig. 6. It is clamped firmly in place and the metal is poured by inverting the entire furnace. At the same time air pressure is turned on to assure sufficient pressure to form thin edges and

to produce a dense, sound structure.

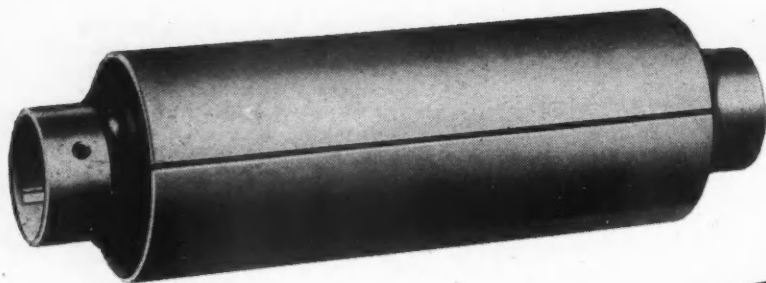
Upon cooling slowly for about four hours, the casting is knocked out of the mold by a pneumatic hammer. Excess investment is removed and the assembly transported by conveyor to another department where the gates and risers are cut off on high speed abrasive saws. Castings are shot blasted to remove scale and investment material unless extremely thin edges make this treatment undesirable. The castings are rough inspected to screen out obvious defects. Then the acceptable castings are sent to the grinding department or smoothing gate areas, hand grinding, internal grinding, etc. Finally all castings are sand blasted to provide a finely finished surface, in some cases shot blasted as well.

Following grinding and polishing the castings return to the inspection department for visual and dimensional checking. Because of the nature of the parts and their application it is necessary to make special tests

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Fig. 7—After passing visual and dimensional inspection, castings are subjected to the Magnafux Zyglo inspection for surface perfection

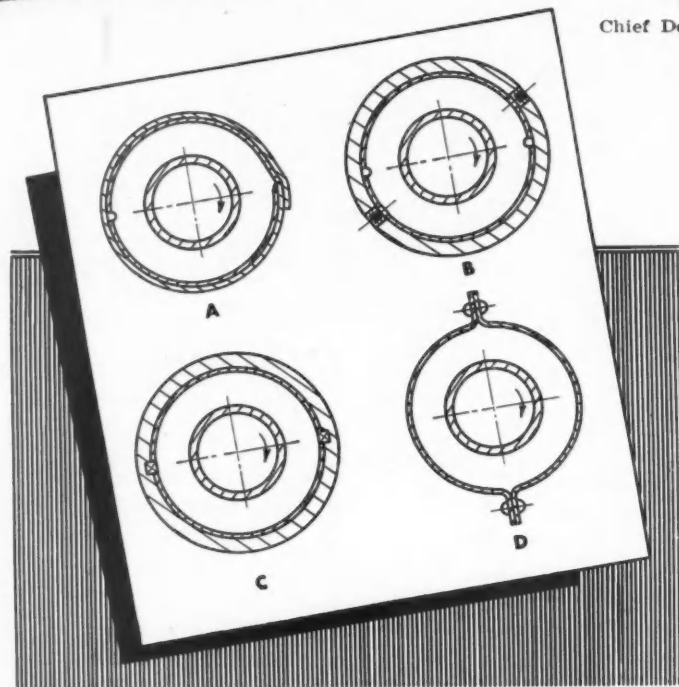


Design

By A. S. Krotz

Chief Development Engineer-Suspensions,
The B. F. Goodrich Co.

Fig. 1 — Torsilastic spring and four types of outer members.



wide range of designs will meet any fixed requirement for static load and rate. That is, the spring may be long and slender or short and thick, depending on such chassis considerations as clearances and the amount of flexibility desired in the mounting. It is, therefore, necessary to know something about the characteristics of such a spring before proceeding to more detailed spring design.

The Torsilastic springs shown in Fig. 1 is typical of a design for the front suspension of a 3400 lb car. The spring can be locked into the housing

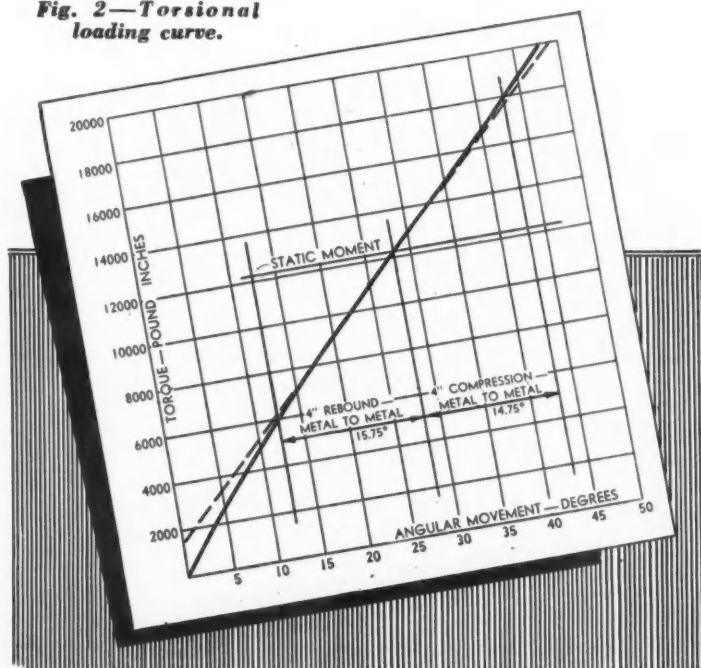
by a tangential tongue as in "A," by Allen screws shown in "B," or by locking keys as in "C." The outer housing can be eliminated by using flanged split

IN CONSIDERING the application of rubber torsion springs to any passenger car chassis, the logical place to start is with the chassis limitations. It is assumed that distribution of mass is already fixed by necessity or preference. Static deflection of front and rear springs can usually be determined by these same considerations and by experience with past models that were well balanced.

It may be assumed that static loaded deflection will be from 7 to 12 in. for passenger cars and considerably less for commercial vehicles. From the proposed layout the length of effective arm from the rubber spring to the outer hinge point can be determined, although rubber torsion springs permit somewhat more freedom since there are no coil spring seats, no seat angularity problem, or high leaf spring stresses to limit the designer. In general, the tendency will be toward making the wheel support arms shorter with this type of suspension than has been customary with steel springs. With arm length and static spring load and static deflection determined, the loaded moment and torsional rate of the spring is fixed.

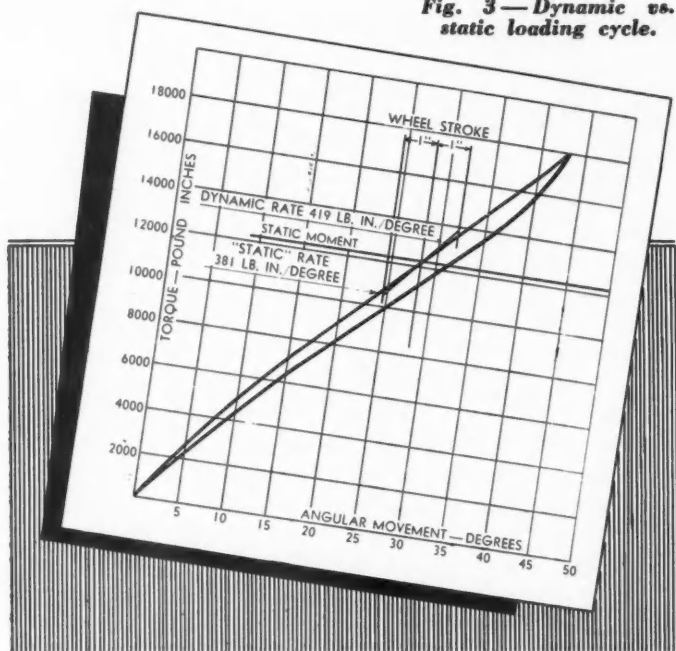
Where the moment and torsional rate of the rubber spring are known, it is possible to proceed with problems of spring design. A

Fig. 2 — Torsional loading curve.



of Rubber Torsion Springs for Passenger Cars

Fig. 3—Dynamic vs. static loading cycle.



shells as in "D." This type spring has the characteristics shown in the succeeding figures. Fig. 2 is the torsional loading curve for the spring in Fig. 1. The steeper slope at light loads is typical and a somewhat more pronounced stiffening at high angles is found with some designs. However, for all practical purposes it is a constant rate spring throughout the range useful in suspension.

The rate or frequency of the cycle modifies not only the hysteresis loss but also the slope of the stress-strain curve for any rubber spring. Fig. 3 illustrates this with a superimposed curve which simulates actual service conditions. That is, at a load corresponding to car plus five passengers, the spring is given an angular oscillation equivalent to one in. compression and one in. rebound, making a total of two in. length of stroke of the road wheel. Road tests show that such a movement comes at an average of one every half-mile for normal cross-country driving. The static loading and unloading curves, forming the hysteresis loop shown here for the whole range of spring deflection, were obtained by loading weights on a beam to give variable

moments on the spring. With this method several seconds elapse between readings and the complete cycle requires two to five min. Under these conditions the resultant "static" stress-strain curves will average 20 per cent lower slope at normal loaded deflection than the slope of the dynamic curves.

The dynamic oscillation test (see Fig. 3) is made in the laboratory by suspending a mass on a moment arm which produces the static loaded torque on the spring. The mass is then excited and the free or resonant period of oscillation observed. The length of laboratory arm need not be exactly the same as the wheel support arm to be used on the car, since we find very little difference in the calculated dynamic torsional rate for the same spring at frequencies from one-half cycle per second to two cycles per second. Resonant frequencies are easily converted into dynamic torsional rates by applying the pendulum formula,

$$d = \left(\frac{188}{f} \right)^2$$

The deflection "d" is then the nominal length of arc through which the spring turns before it supports the average moment, and unit torsional rate is obtained by dividing the moment by the subtended angle. Under these conditions the hysteresis loss during the two in. dynamic stroke is so small as to be

Fig. 4—Deflection under tilting and axial forces.

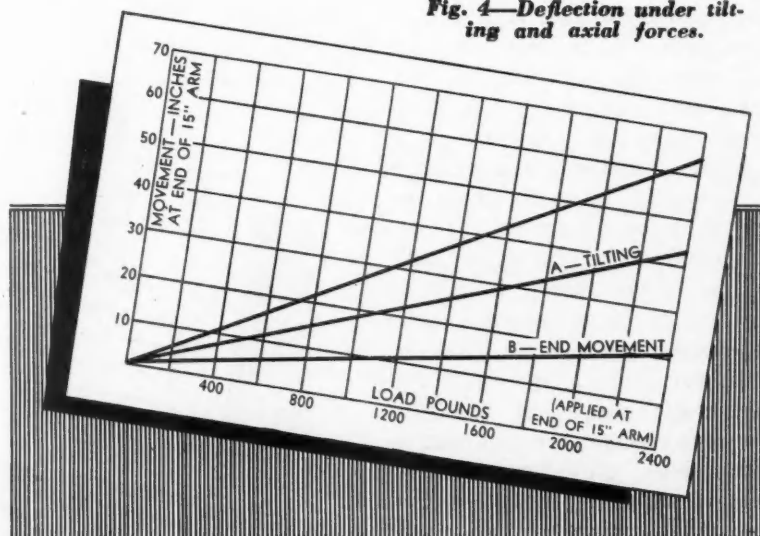
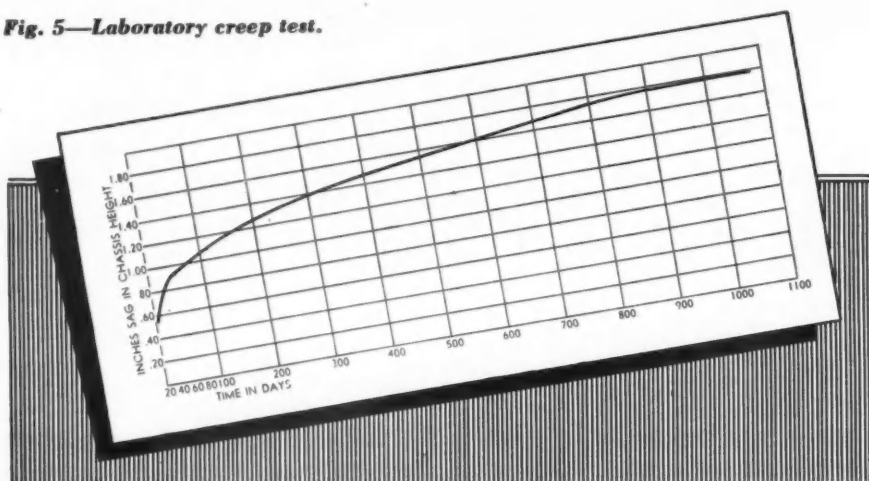


Fig. 5—Laboratory creep test.



difficult to show on a graph of this type. These curves, while applying directly to the Goodrich Torsilastic springs, are similar to the curves for many other types of rubber springs and indicate the difficulty of dispensing with shock absorbers as is sometimes proposed where rubber springs are used. For large strokes the damping effect of hysteresis becomes noticeable but for short strokes, particularly as in controlling wheel hop, shock absorbers are desirable to attain the standard of ride expected by the buying public in this country.

The graph in Fig. 4 shows the resistance to tilting and to axial displacement. This slight elasticity is advantageous in reducing harshness of ride, and the total amount of any such displacement can be controlled over a considerable range by the proportions selected for the spring. The curve in Fig. 5 gives the creep or set of a different size of Torsilastic spring in a laboratory test extending three years to date. This spring carries a static shear of 135 psi on the outside diameter of the shaft. Fig. 6 is the creep record for rubber springs like the one shown in Fig. 1, and was taken from actual service records on a test car rather than from laboratory test. These rubber springs have not been adjusted for height or serviced in any way after 2½ years, although the car was somewhat high when springs were installed, and is now approximately ½ in. low. During 2½ years, the car traveled more than 36,000 miles and had very rough handling. Anyone of a number of methods can be used to take out the early creep as shown by the nearly vertical rise at the left of the graph. It should be noted that creep is not a straight line function when plotted against static load. That is, a 10 per cent change in static load may cause more than 10 per cent change in creep over a given time. However, it seems best in most cases to keep the size of the spring down and take

a slight amount of creep and provide a simple adjustment which need not be serviced more than once a year under normal conditions.

For passenger car independent suspension designs having roughly 7 in. to 12 in. static deflection and 8 in. wheel stroke, that is 4 in. compression and 4 in. rebound, we find that static shear stress from 120 psi up to approximately 150 psi on the outside diameter of the bushing shaft gives satisfactory results. This figure is modified by the type of service and the hardness of stock used. The spring used

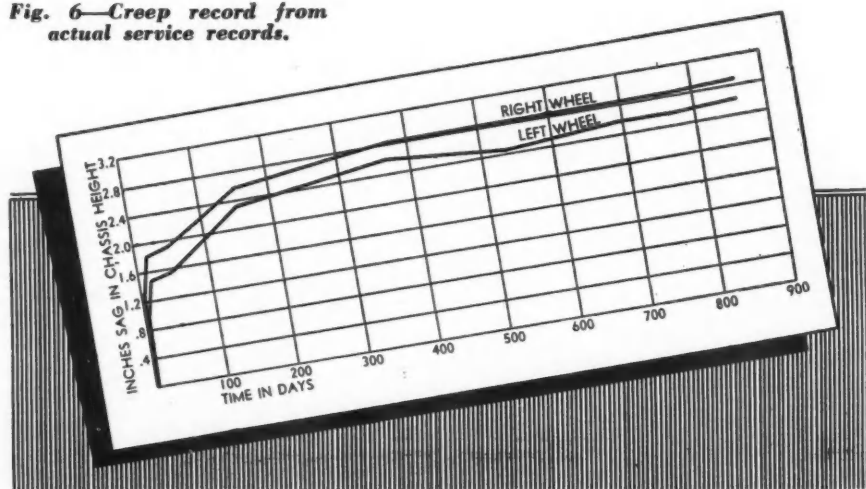
as an example in preceding figures was designed for and tested at 122 psi static shear and maximum wheel stroke gave 182 psi static shear. For mounting machinery the allowable static stress may be less than half of this figure.

The spring shaft can be designed by providing for the required static moment (as transmitted through the rubber bonded to its outside diameter) at the desired unit shearing stress on the rubber bond. The decision as to the combination of length and diameter of the bonded area will depend on the elasticity or flexibility (other than angular) desired of the bushing in its function of mounting or bearing for the suspended wheel parts and of course will depend on torsional strength of the shaft and chassis considerations.

After determining the shaft diameter and effective length over which rubber is to be bonded in order to bring the static shear stress to 120 psi or any other figure decided upon, the thickness of any rubber compound required to give the desired torsional rate can be determined.

The mathematical analysis for relating the functions of rubber thickness and spring rate is shown in the diagram, legend and formulae shown at the bottom of the facing page.

Fig. 6—Creep record from actual service records.



The difficulty with applying such an analysis is that any equation involves the shear modulus G for the rubber compound. It is common practice to assume that G is defined by the slope of the tangent to the shear curve for small amplitudes of movement. Such a tangent is drawn on the shear curve in the graph at the lower right of Fig. 7, and departs seriously from the slope of the curve in the range of actual stress. This curve was derived from tests of a sample rubber "sandwich" cured between flat plates and stressed by parallel movement of the plates.

Since every particle of rubber in the torsion spring may be thought of as an element in the thin layer dr , the entire body of rubber is stressed in shear, the shearing stress varying inversely as the

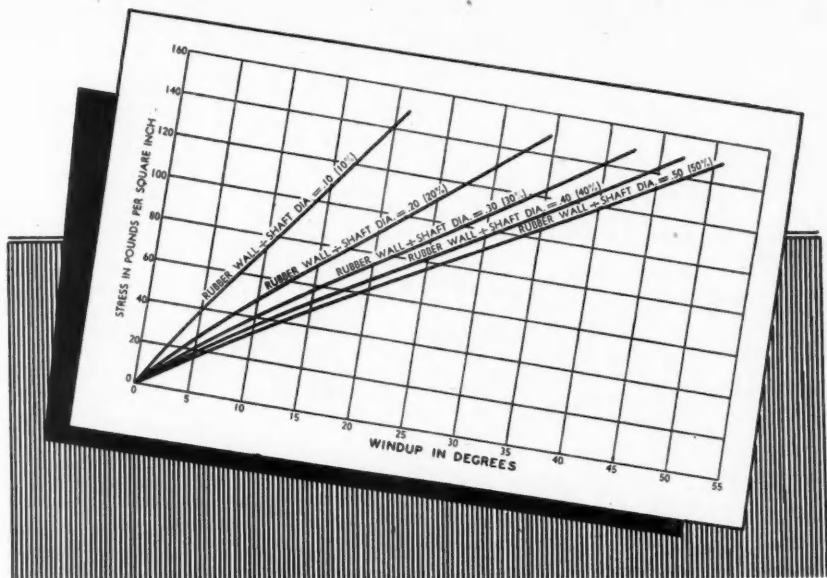


Fig. 7—Section through torsilastic spring and shear curve.

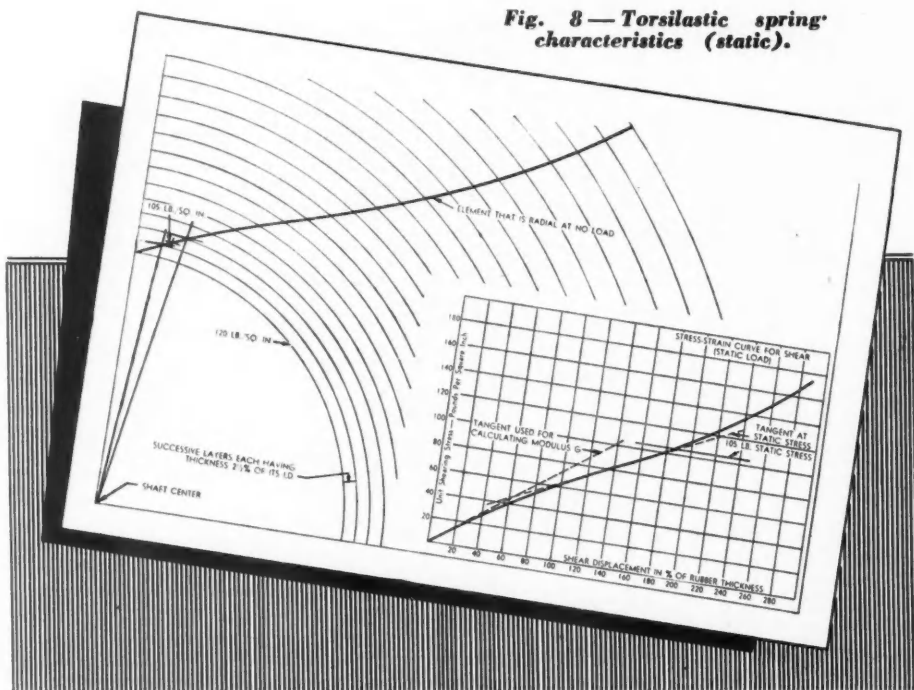
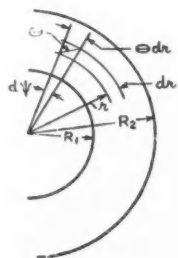


Fig. 8—Torsilastic spring characteristics (static).

Mathematical analysis for relating the functions of rubber thickness and spring rate is shown below.



R_1 = INSIDE RADIUS OF RUBBER
 R_2 = OUTSIDE RADIUS OF RUBBER
 R = RADIUS TO ANY ELEMENT
 L = LENGTH OF BUSHING
 S = UNIT SHEARING STRESS
 T = TORQUE
 ψ = ANGULAR DEFORMATION
 G = SHEAR MODULUS
 $\theta = \frac{\psi}{L}$ (FOR SMALL ANGLES)
 $d\psi = \frac{\theta}{L} dr$

FOR ANY GIVEN TORQUE,
 $T = 2\pi R \times S \times L$
 $= 2\pi R^2 S L$
 SINCE $R^2 S$ IS A CONSTANT,
 $S = \frac{T}{2\pi R^2 L}$
 $d\psi = \frac{S}{G} \frac{dr}{R} = \frac{R^2 S_1 dr}{L G R^2}$
 $\psi = \frac{R_1^2 S_1}{G L} \int_{R_1}^{R_2} \frac{dr}{R^2}$
 $\psi = \frac{R_1^2 S_1}{2G L} \left(\frac{1}{R_1} - \frac{1}{R_2} \right)$
 ANGULAR DEFORMATION,
 $\psi = \frac{T}{4\pi L G} \left[\frac{1}{R_1} - \frac{1}{R_2} \right]$

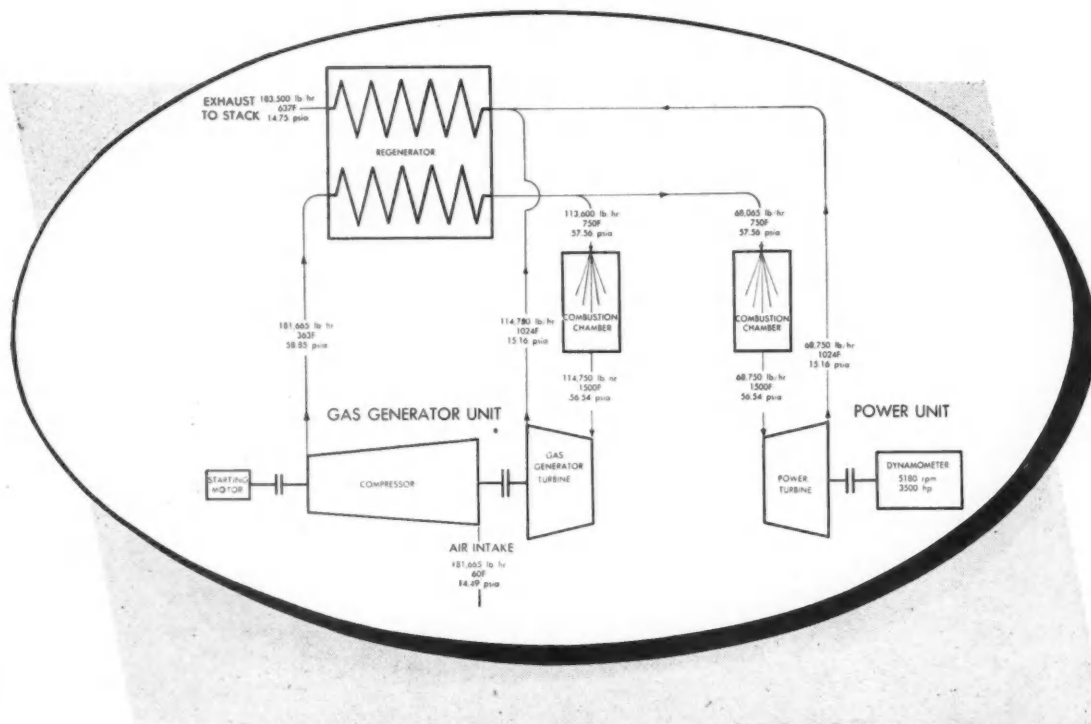
square of the radius to the particle. This analysis is given in mathematical form, and can be used also in a graphical approximation which is fairly accurate. This has been done in Fig. 7 by assuming that the body of rubber is divided into successive layers each having a thickness equal to five per cent of its inside radius. The heavy spiral line represents the position taken under torsional deflection by a theoretical element in the rubber which is radial at no load. In each of the successive layers the distorted element departs from the radial direction by the angle of departure for that stress as obtained on the shear "sandwich." One such graph is all that is needed for each rubber compound to cover the widest as-

sumed range of unit static stress and torsional rate. For lower static stresses it is only necessary to move out to a new radius where the required shear stress exists and strike a new arc to represent the inside diameter of the rubber.

The amount of angular deflection is controlled by the shearing stress on the rubber and by the thickness of the rubber wall. Soft rubber will deflect more than harder compounds and the range
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By
**James R.
Custer**

Allis - Chalmers Undergoing High



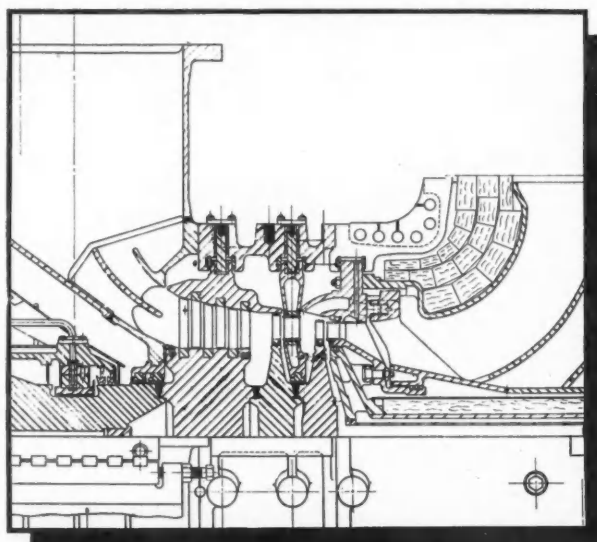
Cycle diagram of Allis - Chalmers 3500 hp experimental gas turbine at Navy engineering station. Data shown are for full load conditions.

ANOTHER advance in gas turbine development was accomplished recently when the Navy's 3500 hp experimental gas turbine satisfactorily completed 50-hr test runs at a turbine inlet temperature of 1350 F and at full speed of 5200 rpm. So far it has been in operation over 500 hr at high temperatures and the next test runs will be at 1500 F, for which it was designed and constructed by the Allis-Chalmers Mfg. Co. under a contract made with the Bureau of Ships, U. S. Navy, in 1940. It is claimed to be the most powerful high temperature gas turbine in the world.

Many design details of this research unit, installed two years ago at the U. S. Navy Engineering Experiment Station in Annapolis, Md., were disclosed March 29 to a group of trade and technical magazine editors. Although the unit at Annapolis is purely an experimental setup with elaborate test and control equipment for obtaining data for future gas turbine development and eventually the installation of a gas turbine in a ship, it is believed that much valuable information is being obtained that will be useful for both marine and land applications.

This experimental gas turbine operates on the parallel turbine regenerative cycle, one turbine driving the compressor and the power turbine driving a water brake dynamometer. A diagram of the cycle

is shown elsewhere in the article. Other cycles could have been selected that would give higher thermal efficiencies, but in this project thermal efficiency was



Sectional view of upper half of multi-stage turbine.

3500 hp Gas Turbine Temperature Tests

considered of secondary importance as emphasis is being placed on data at high temperature operation and the parallel arrangement offers the necessary flexibility. This research plant probably has a thermal efficiency of around 25 per cent, but for ship installation a gas turbine power plant could be built having an overall thermal efficiency of 40 per cent, Allis-Chalmers engineers state. The air compressor of this more efficient plant would be divided into two sections with intercooling between the low and high pressure units. Instead of a parallel arrangement, the turbines would be in series with reheat at the inlet of the low pressure turbine.

At full load the present axial flow compressor (see illustration), which has 20 stages and operates at about 85 per cent efficiency, takes 40,000 cu ft of air per min at atmospheric pressure and compresses it to 45 psig. From the compressor the air flows to the exhaust gas heat exchanger where its temperature is raised from 363 F to 750 F.

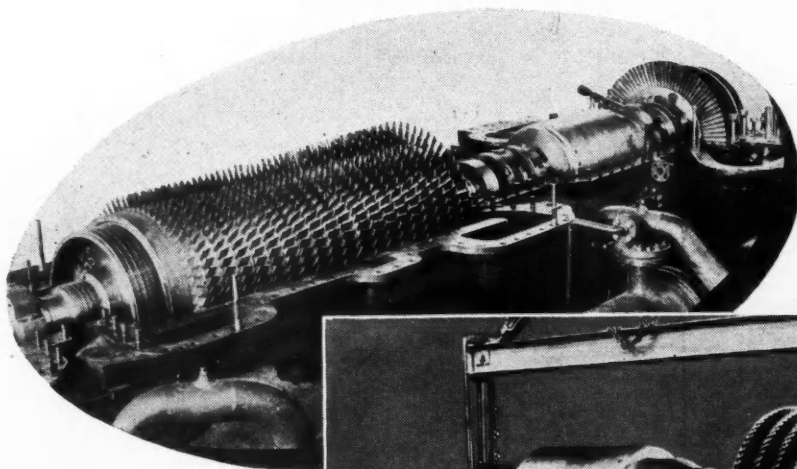
Two combustion chambers are provided, one for the compressor turbine and the other for the power turbine, which makes it possible to control the operation of each turbine independently. The heat release in the two chambers at full load is about 2,500,000 Btu per cu ft per hr. At present No. 2 furnace oil is being burned, but for the shipboard installation it is planned to burn fuel of grades as low as bunker C fuel oil. For land installation the fuel is to be powdered bituminous coal.

Each combustion chamber has a single nozzle which sprays oil into a large central flame tube that receives sufficient air

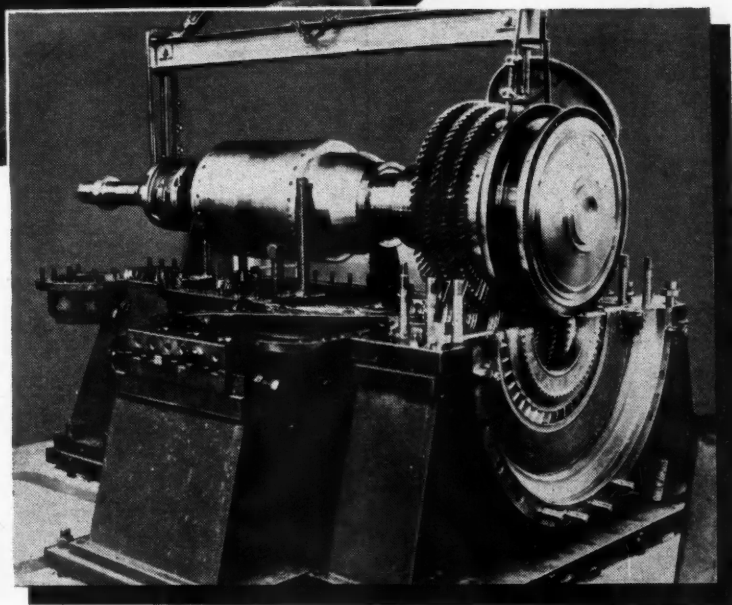
to support combustion. This central flame tube extends half way down the combustion chamber. The remainder of the air (secondary) that is fed into the combustion chamber flows between the inner wall of the combustion chamber and the flame tube. The combustion gases in the flame tube rotate counterclockwise and the secondary air is turned in a clockwise direction by vanes, so that when the two streams begin mixing they are whirling in opposite directions. Directing the secondary air around the flame tube also eliminates the need for brickwork on the wall of the combustion chamber.

Construction of the two turbines is substantially the same. Each has five pressure stages—two impulse stages and three reaction stages. Both turbines and the compressor have sleeve bearings, which are pressure lubricated. Turbine spindles are of overhung design with no bearing on the wheel end,

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(Oval) Axial flow compressor and turbine, with top half of case removed.



(Right) Turbine spindle of overhung type being lowered into cylinder. Heavy shaft at left is provided for counter balancing.

Ford of Canada Announces

New Car and Truck

IN KEEPING with its new dealer setup, the Ford Motor Co. of Canada, Ltd., has announced a new line of vehicles—the Monarch passenger car and the Mercury truck. The Monarch, which will be handled by Ford-Monarch dealers, is a medium-priced car similar to the Mercury sold in the United States. The Monarch will be available in the following body styles: four-door sedan, town sedan, sedan coupe, club convertible, and station wagon.

The engine is a V-8, 3 3/16 in. bore by 3 3/4 in. stroke, 239 cu in. displacement, rated 97 hp at 3800 rpm. Many of the engine features follow the pattern of Ford Motor Co. engines of this size in the U. S. A. for 1946. A feature exclusive to the Canadian engine is the use of individual connecting rod bearings of precision type of locked-in design as contrasted with the floating type used in the U. S. They are of copper-lead type with lead-tin coating on a steel back. Main bearings are of cadmium-nickel with steel back. Crankshafts incorporate what is termed a centrifuge sediment trap in each crank-pin. This consists of a blind end bore in each crankpin, closed at the outer end with a removable plug. The oil holes, carrying pressure lubrication to the bearings, communicate with these bored holes. These traps accumulate foreign particles, particularly during run-in, and are to be cleaned whenever the bearings are serviced. Oil is fed to all points at a pressure of 60 psi.

The clutch, transmission, battery, rear axle and drive, steering gear, brakes, etc., are the same size and type as those used on the Ford Motor Co. cars of this price range in the U. S. The body styling of the Monarch is shown in the illustration.

New Mercury Trucks

A new line of Mercury trucks with Hotchkiss drive ranging from a 114-in. wheelbase half-ton pickup model to a three-tonner with 76 in. wheelbase, comprising 39 models, has been announced for distribution by the newly created Mercury-Lincoln dealer group in Canada. It is of interest to find that this line features standard SAE cab-to-axle dimensions and frame width, thus permitting the installation of 9, 12, and 14-ft stake bodies as well as a wide range of special purpose and custom-built bodies.

Two Mercury truck engines are offered in this line, a 221 cu in. V-8 for the 1/2 and 1 1/2-ton capacity and a 239 cu in. V-8 for the 2-ton, 3-ton, and school bus chassis. The 221 cu in. engine has a bore of 3 1/16 x 3 3/4 in. stroke, rated 93 hp at 3800 rpm. It features interchangeable aluminum cylinder heads with a compression ratio of 6.8 to 1. Maximum torque is 166 lb ft. The 239 cu in. engine has a bore of 3 3/16 x 3 3/4 in. stroke, rated 100 hp at 3800 rpm. It fea-

The new Monarch car



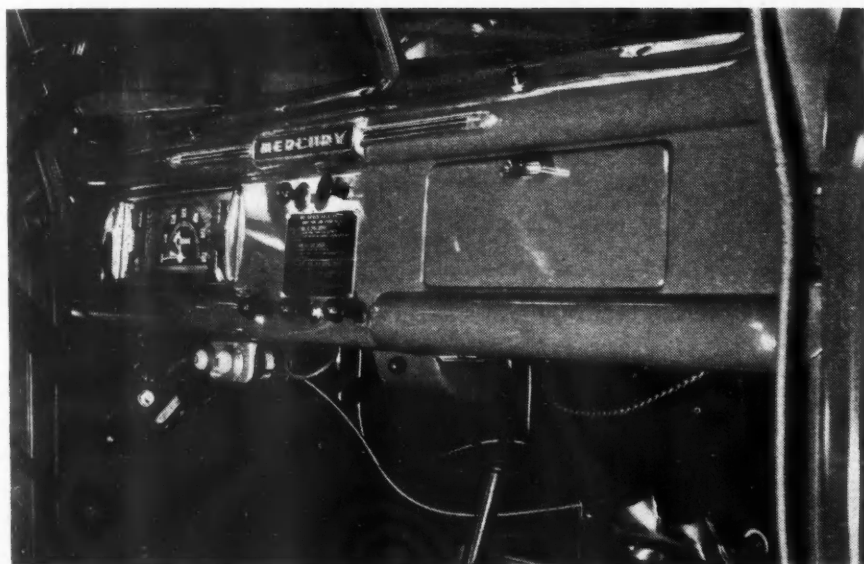
Models

tures interchangeable aluminum cylinder heads with compression ratio of 7.2 to 1. A special high torque camshaft providing earlier opening of intake and exhaust valves gives a maximum torque of 188 lb ft at 1400 rpm.

Features common to both engines include: four-ring aluminum pistons, hard alloy intake and exhaust valve inserts, aluminum timing gear, precision-set valves, full pressure lubrication with removable oil pan under the oil pump to facilitate cleaning of oil pump and screen, dual downdraft carburetor with balanced carburetion, oil bath air



Front view of 3-ton Mercury truck



Close-up of Mercury truck instrument panel

cleaner, replaceable cartridge type oil filter, pressure valve radiator cap, split flywheel housing to facilitate servicing.

Distinctive features of the engines include the high torque camshaft for the 239 cu in. engine, centrifuge type sediment traps in each crankpin, and the use of copper-lead lead-tin coated bearings with steel back in connecting rods. These bearings are of replaceable type, locked in the rod instead of the floating type used in Ford truck engines in the U. S. A. Main bearings are of cadmium-nickel with steel back, the main bearing caps being piloted for positive alignment to increase bearing life.

The 3-ton and school bus chassis feature full-floating two-speed rear axles with vacuum shift. Universal joints on all models are of needle roller bearing type. The $\frac{1}{2}$ ton model uses the 10 in. semi-centrifugal clutch. The 1-ton and $1\frac{1}{2}$ ton jobs have 11 in. semi-centrifugal clutches; while the 2 ton, 3 ton, and school bus chassis have the 11 in. semi-centrifugal heavy duty type clutch. Transmission setup is as follows: 3-speed blocker type unit on the $\frac{1}{2}$ ton; and 4-speed truck type on the other models, with automatic internal spring type reverse lock on 4-speed models.

Rear axle on the $\frac{1}{2}$ ton model is of $\frac{3}{4}$ floating type with standard ratio of 3.78 to 1 and option of 4.11 to 1. The 1 ton axle is of full floating type with a ratio of 4.86 to 1 and option of 4.11 to 1. On the $1\frac{1}{2}$ ton, the axle is full floating with ratio of 5.83 to 1. On the 2 ton the axle is full floating with ratio of 6.67 to 1 and option of 5.83 to 1. The 3 ton and school bus axles are of full-floating, two-speed type with standard ratio 6.33 to 1 and 8.80 to 1 and an option of 5.83 to 1 and 8.11 to 1.

Steering gear is of worm and roller type with ratio of 18.2 to 1 on the $\frac{1}{2}$ and 1 ton models; 18.4 to 1 on the others. Brakes are hydraulic on all models, with driveshaft hand brakes on all models from 2 ton up-

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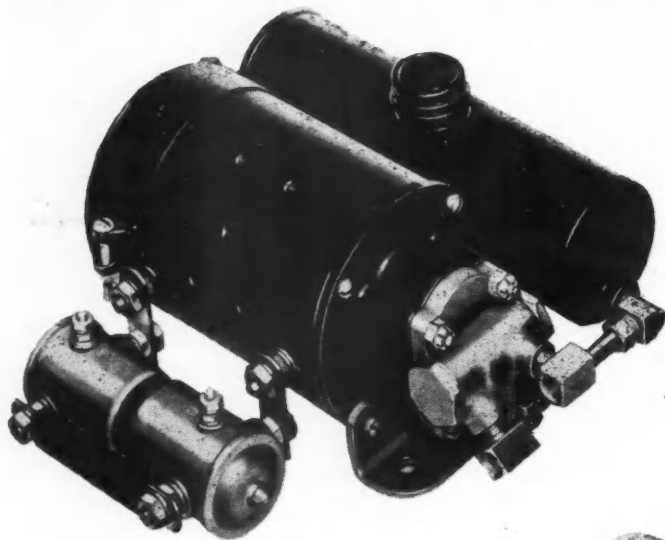


Fig. 1. Power Unit consisting of solenoid, electric motor with pump and oil reservoir

SEVERAL automobile manufacturers are testing hydraulic systems for raising and lowering door windows, engine hoods, trunk lids, and adjusting drivers' seats, and are considering installing them in their 1947 models. Of the various types of actuators and pressure sources being used, one typical system has two basic units—the power unit and either a sector shaped paddle-type actuator or an actuating cylinder depending upon the amount of space available, the character of movement, and the force required. Only one power unit, located at any convenient point, is necessary to operate all of the actuators in a system. The power unit consists of a standard, automotive type 6-volt electric motor, a solenoid device for reversing the motor, an eight-oz. reservoir, and an oil pump which is incorporated at the front end plate of the motor (see Fig. 1). The reversing feature makes possible positive two-way control of each actuating device. Through the use of a by-pass valve which is part of the pump porting, the pressure generation is accurately controlled over a range from 150 to 250 psi with a fluid capacity of approximately two gpm. This pressure control adjustment provides the proper safety factor, and overrun of the motor when the windows, lids, etc., are fully up or down can do no harm. The valve also is so designed that when in neutral with power off the fluid may be by-passed by manual operation of the part. Furthermore, this pressure regulation permits adjustment to fit the force conditions present in parts in different makes of cars or to suit the preferences of individual drivers.

The reservoir capacity is only necessary to take care of the fluid displacements of the cylinder piston rods, and facilitate filling. In the operation of the unit the reservoir is connected in series with the intake vacuum side of the pump, and the return lines from the actuators.

Hydraulic Window

By Stewart B. McLeod

Chief Engineer,
Automatic Power Division,
Motor State Products Co.

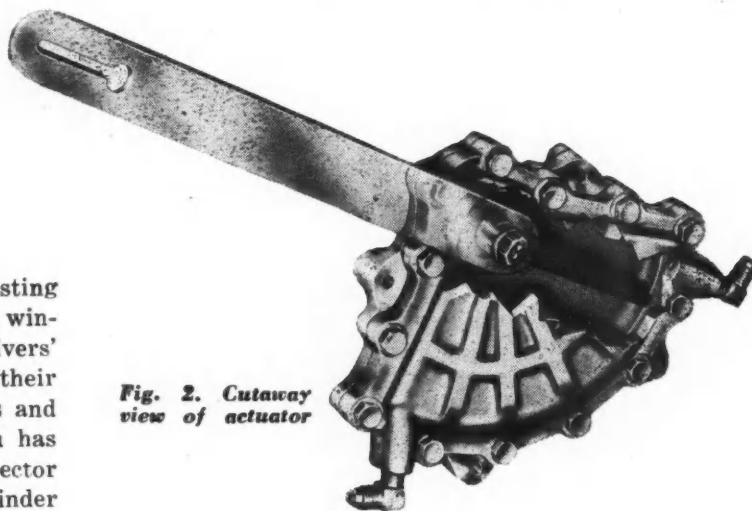


Fig. 2. Cutaway view of actuator

Of the two types of actuators reacting from the hydraulic force of the power unit, the fan-shaped, paddle-type actuator (Fig. 2) is the latest innovation. Its present application is for operating windows, but due to its efficiency and compact size, it can be adapted to other uses. The actuator is designed to supply a surplus lifting power of approximately 30 to 40 lbs over that normally required to move automobile windows. This serves to insure proper window operation under adverse climatic conditions and yet maintain adequate safety factors. The speed of operation can be varied from one to 10 seconds, depending upon specific requirements. The most generally accepted speed is approximately two seconds. The unit consists of three major parts: two die cast body halves, and an actuator paddle through which the torque is applied directly to the window. Locking of the window is accomplished by an electric solenoid valve which, when the power is off, closes and traps the fluid, thereby giving a positive lock to the window in any position, without maintaining hydraulic fluid pressure either in the actuator or the fluid lines.

At the present time, these actuators are made in only one size and capacity since this size seems to cover all immediate and projected needs in automotive design. The radius of the unit is approximately four in. and it is 1½ in. thick.

Operation of Engine Hood, and Other Car Facilities

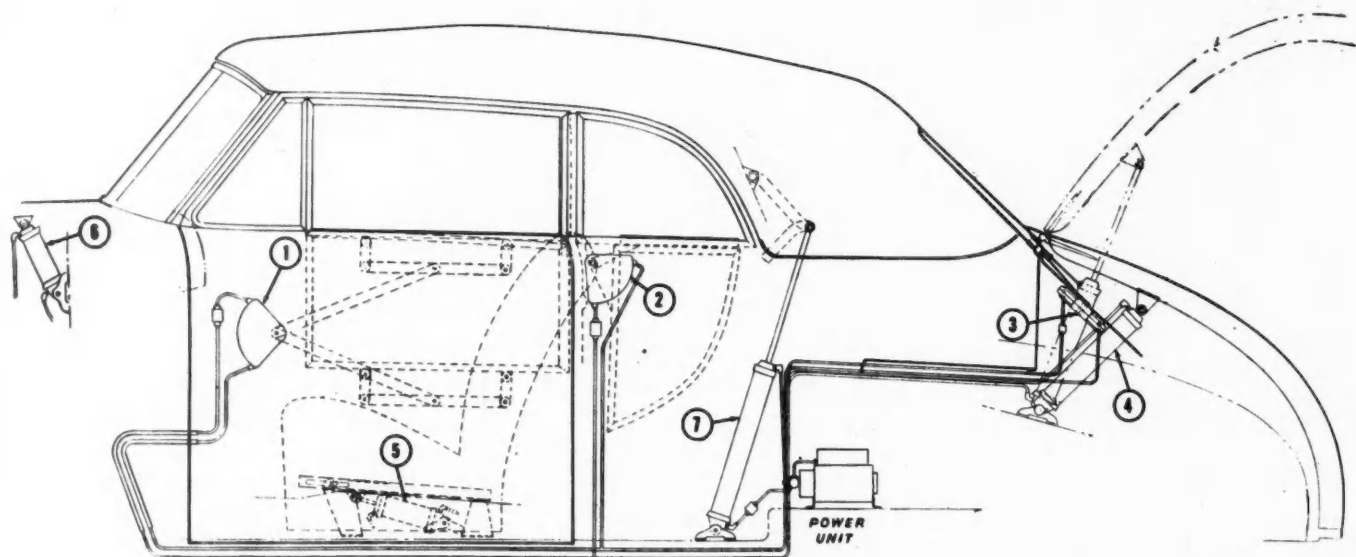


Fig. 3. Schematic drawing of servo hydraulic system

The actuating cylinder is a two-way acting hydraulic unit approximately two in. in diameter, consisting of two die cast end plates, a cylinder tube securely crimped over synthetic rubber seals retained in the end plates, and a molded synthetic rubber piston which actuates the piston rod through a molded packing, making a permanently sealed unit and preventing leakage. The length of the cylinder and the stroke depend upon the use to which it is being adapted.

In the case of convertible tops, raising and lowering operations involve the simultaneous application of force on two sides of the top structure. The hydraulic system, with its characteristic of equalized pressure, eliminates any tendency to twist, bind, or bend the framework. Then too, the feature of adjustable pressure to accurately balance the whole operation permits

the action to be stopped by the slightest resistance, even though the motor and pump continue to revolve. No damage can result from overrun in either direction. When the power is off, an inter-connecting valve connects both ends of the cylinders. This feature makes it possible to operate the top manually without damage to the mechanical parts. In other applications such as raising and lowering the hood and rear deck and moving the driver's seat fore and aft, only one cylinder is used, as illustrated in Fig. 3. In all present applications, the cylinder is mounted close to the point of power application with a clevis and pin or bolt, so that the unit can swing in one direction.

New Ford Car and Truck Model for Canada

(Continued from page 31)

ward. The 3 ton and school bus chassis include vacuum booster as standard equipment. Brake drums on all models except the $\frac{1}{2}$ ton are of composite construction, cast iron surface with steel disk. Drum diameter is 12 in. front and rear on the $\frac{1}{2}$ ton with a lining area of 162 sq in.; 12 in. front and 14 in. rear on the 1 ton with 186.8 sq in. area; and 14 in. front and 15 in. rear on the other models, with a lining area of 303 sq in.

Heavy duty type frames are supplied for these vehicles, with high tensile alloy steel reinforcements for the 2 ton, 3 ton and school bus frames. The $\frac{1}{2}$ ton pick-up has a 114 in. wheelbase, and the 1 ton is a 122 in. wheelbase chassis. The $1\frac{1}{2}$ ton job is offered in 134 and 158 in. wheelbase, while the 2 and 3 ton give a choice of three sizes—134, 158, and 176 in.

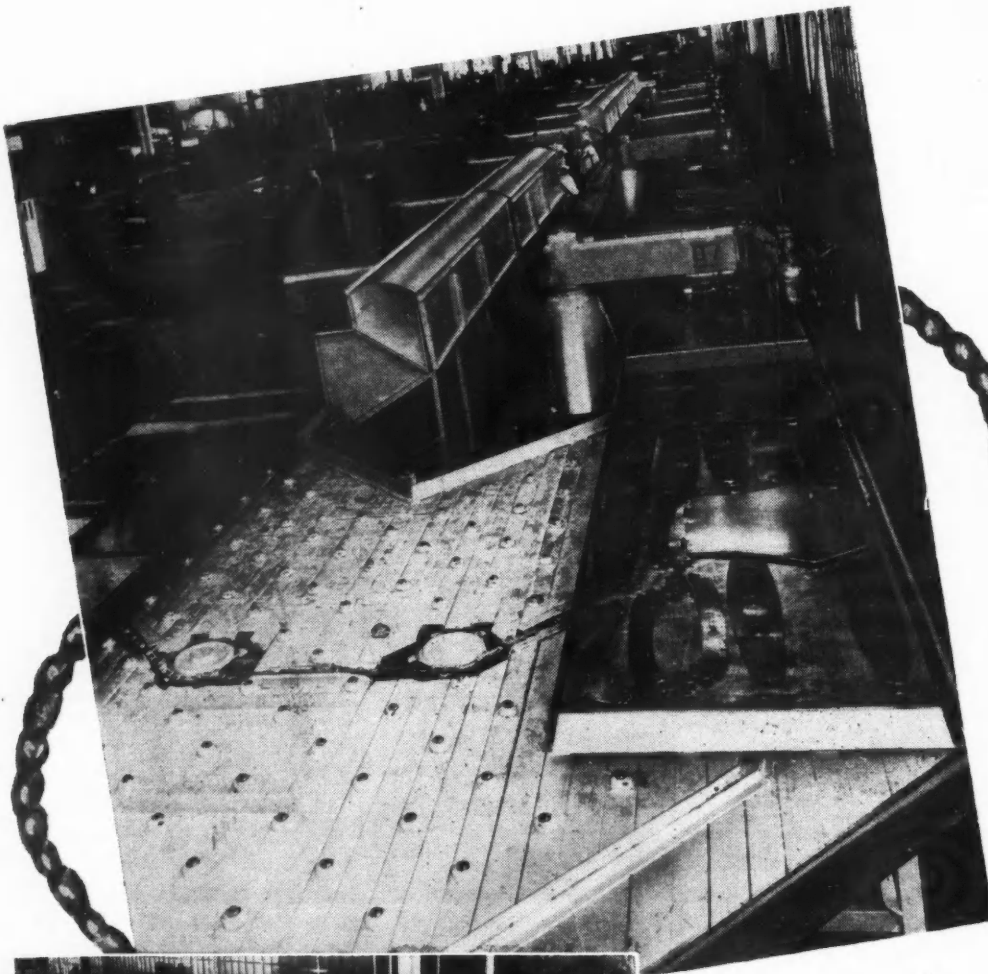
Shock absorber equipment consists of four double-acting, hydraulic shocks

on the $\frac{1}{2}$ ton; two on the front end of the 1 ton; and two on the front of the special truck tractor 3 ton chassis. Suspension for all models comprises four longitudinal semi-elliptic springs, with five-leaf auxiliary rear springs on the 2 ton and seven-leaf rear auxiliary springs on the 3 ton. Where 9.00-20 tire equipment is specified on the 3 ton jobs, the rear axle has special wide tread in order to provide ample wheel clearance.

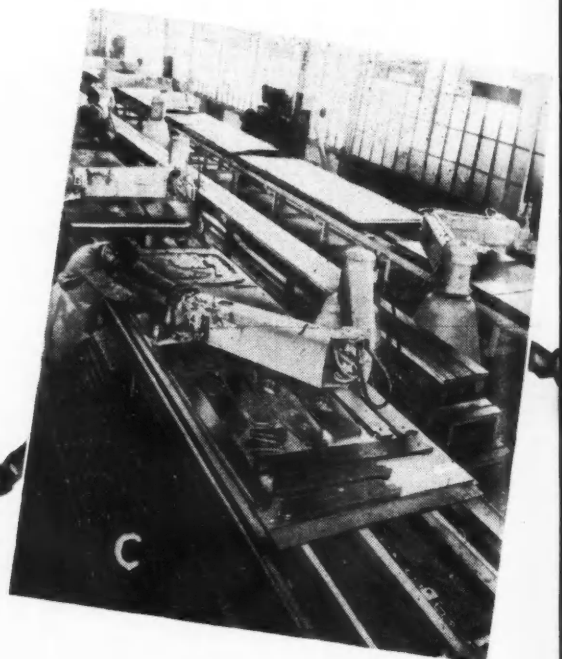
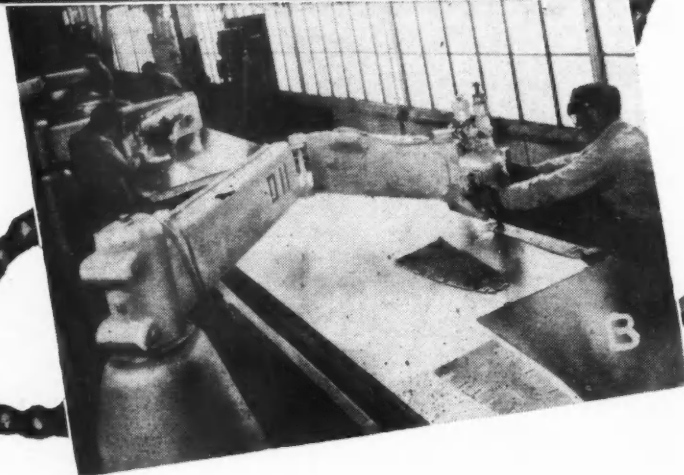
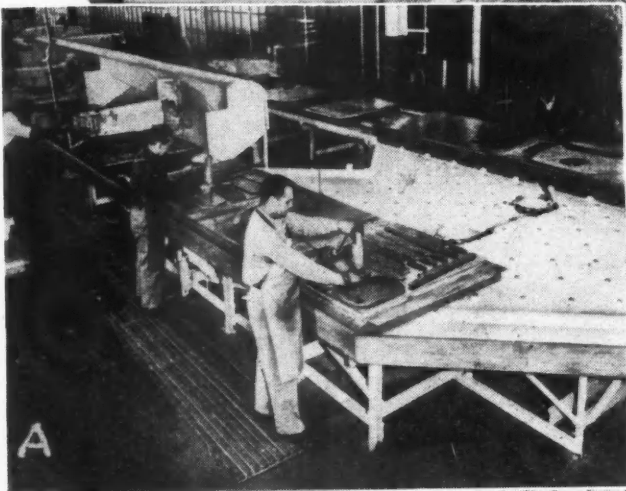
Sheet

A TABLE-TYPE conveyor has been installed in the Material Preparation Department of North American Aviation, Inc., to move sheet metal through the sequences of layout, drilling and routing operations. To perform these three operations by the former system, heavy bulky material had to be moved six times and stored four times. Drilling and routing machines were idle more than 50 per cent of the time while material was being obtained, set up, and unloaded. Trucks obstructed the aisles to such an extent that trucking through the department was practically impossible.

The new method of using 22 stations along an intermittently moving conveyor stationizes the operations in the following sequence. At the first station of the conveyor the 4 ft by 12 ft sheets of ma-



X—View of conveyor line



Metal Conveyor System

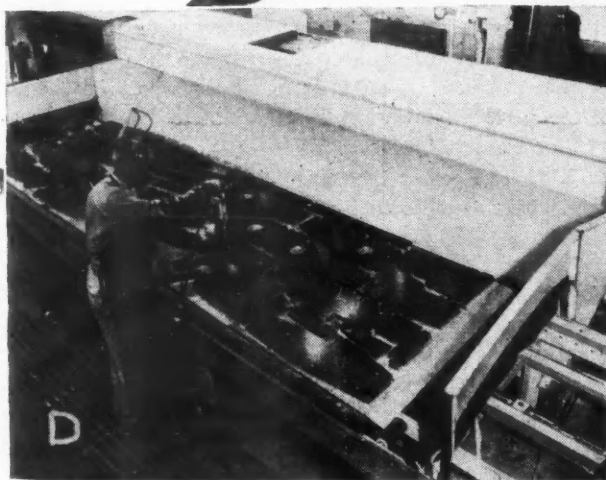
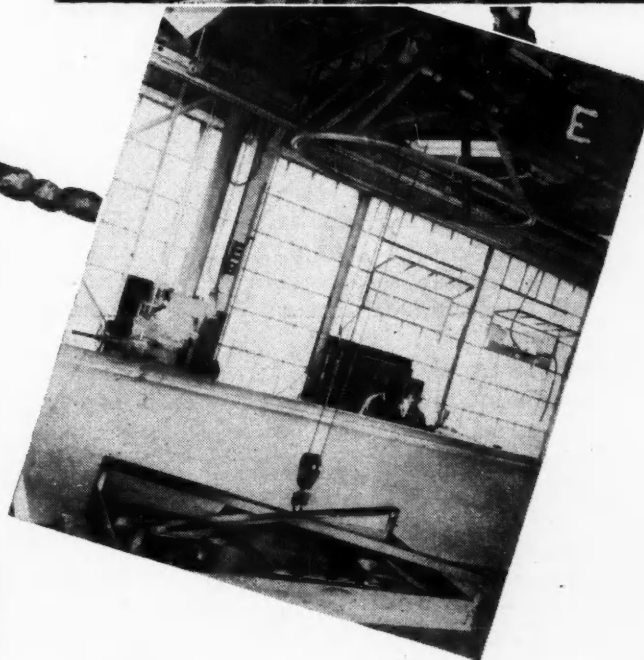
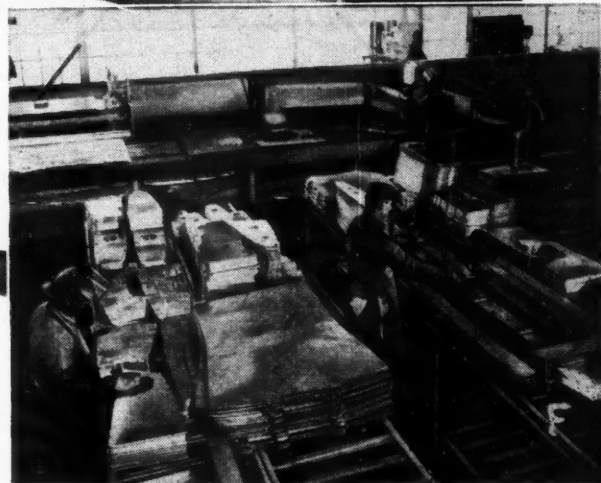
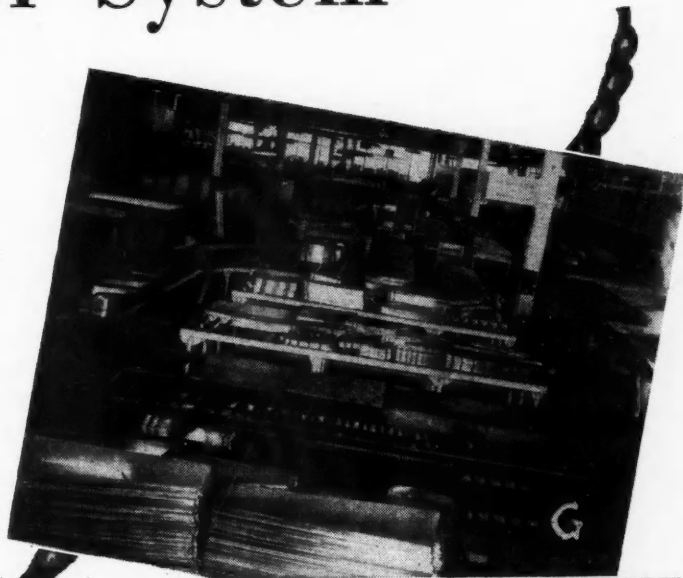
terial in quantities of six to ten sheets are loaded onto a 4 ft 4 in. by 12 ft 4 in. conveyor table by means of an overhead crane. At the next station the rough outline of the parts to be obtained from each sheet are marked on the metal by spray painting through pre-punched paper templates.

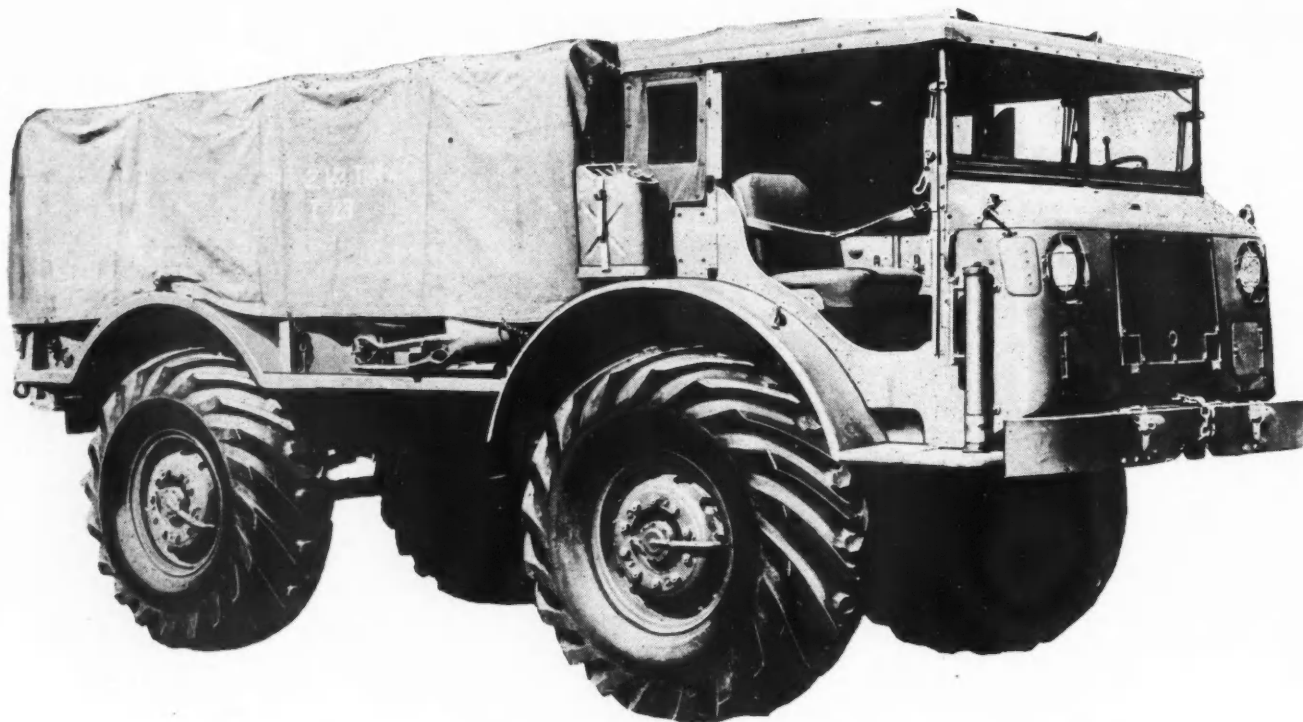
The next four stations are assigned to the drilling, lag screwing the material to the table top, applying the drill templates and pegging them into position by inserting the pegs through the drill templates into the two previously drilled $\frac{1}{4}$ in. holes in each part outlined on the material. These pegs secure the drill templates in the proper location. Pilot, tooling, and all other holes are drilled in the next four positions with high cycle pneumatically fed radial arm drill presses. Drill templates are removed and router templates applied and secured with lag screws at the next two stations. In the following seven positions, odd shaped parts are profiled to size by moving the cutting tool on the high cycle radial arm routers around the outline of the templates.

Routers are equipped as are drills, with a central lubrication system which lubricates the tools, increasing production and decreasing tool

(Turn to page 108, please)

- A—Applying router template
- B—Drilling operation
- C—Routing operation
- D—Removing router template
- E—Conveyorization of templates
- F—Storage after fabrication
- G—Storage to deburring rolls





View of front and right side of Army Ordnance T23 Truck. The steel cab is straddle mounted over the engine with the engine hood separating it into two compartments

Army T23 Experimental Designed for Operation in

SINCE commercial vehicles generally are built to meet satisfactorily road operating ability requirements, the major portion of U. S. Army Ordnance development has been concentrated on improving cross-country mobility. Toward that end the Ordnance Desert Test Command, El Centro, Calif., attached large earth moving tires to standard military trucks and found that the mobility over muddy terrain was materially increased. The improvement in operation was so marked a project on a vehicle specifically designed to use the large tires was authorized, specifications for the new vehicle established and Chrysler was awarded a contract for design and construction of one vehicle. This vehicle, designated T23 Cargo Truck, 2½ Ton-4x4, was completed in January, 1945. Since the pilot vehicle indicated promise for use in swampy areas of the Pacific, four additional vehicles were built and all five vehicles tested.

The primary objectives of the new vehicle were to obtain high ground clearance so it would be able to wade through deep mud without bottoming and to provide sufficient power and tractive ability to move it through this mud. Part of the high ground clearance has been obtained through the use of 18.00 x 26 tires. These have a rolling radius of 28.1 in. This resulting

high clearance has been further increased by the use of a special axle construction, which is shown in Figs. 1 and 2.

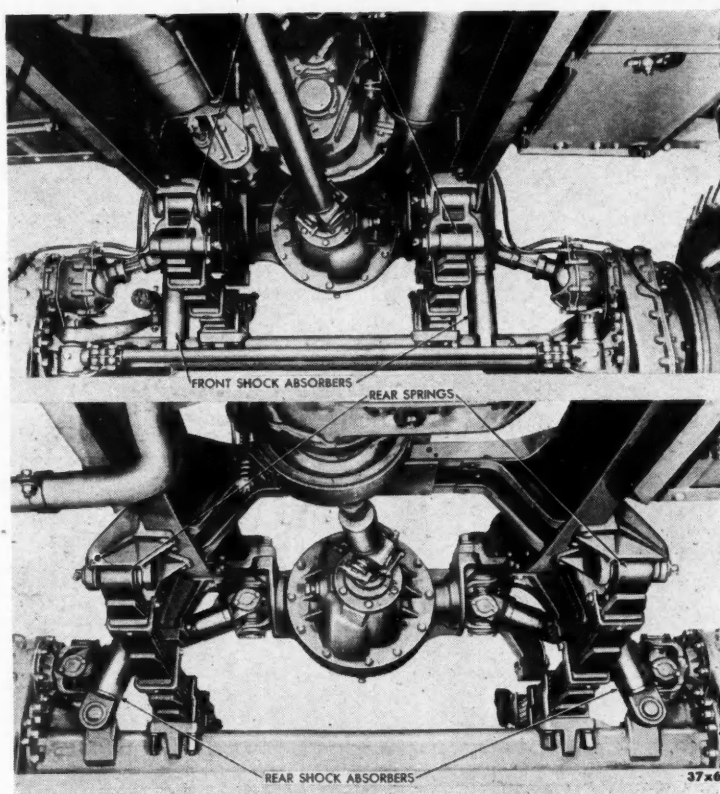
The axle train consists of a differential carrier housing and standard differential with short shafts projecting horizontally from each side. This assembly is mounted between the frame members (see Fig. 3). Short axle shafts with universal joints on each end transmit the power from the differential shafts down to the input shaft of a step-down gear box at each wheel. The wheel step-down gear box serves the double purpose of permitting the placing of the axle differential housing and axle shafts high from the ground and also accomplishing a gear reduction of 2 076 to 1 so axle parts may be held to a minimum size. The wheel step-down gear boxes, supported by a 6 in. square tube dead axle, have their lower drive gears attached to the inner end of the wheel hubs and the wheels attached to flanges on the outer end of the hubs (see Fig. 4). This combination of large tires and special axle construction results in a ground clearance of 25 in. to the bottom of the dead axle as compared to 10 in. to the bottom of the axle bowl on standard trucks.

Sufficient power to enable the vehicle to move

Fig. 2—High clearance front and rear axle construction

By Lt. Col. E. H. Holtzkemper

through deep mud is provided by a Dodge truck engine and adequate gearing. The engine is of L-head design having 6 cylinders, $3\frac{3}{4}$ in. bore, 5 in. stroke, and 331.3 cu in. displacement. The power developed with accessories operating is 105 bhp at 3000 rpm and 254 lb-ft torque at 1000 rpm. The compression ratio is 6.35 to 1 and the governed speed 3000 rpm. The clutch is a Borg & Beck single dry-plate type, enclosed in a steel cover bolted to the flywheel. The transmission incorporates five forward speeds and a reverse, the lowest forward gear reduction being 6.06 to 1. All gears,



Truck Deep Mud

shafts, and bearings are interchangeable with those of the transmission of the standard Truck, $2\frac{1}{2}$ Ton, 6x6, Cargo. A power take-off is provided on the left side of the transmission case and supplies the power to drive the winch. A two-speed transfer case, mounted in the center of the vehicle, makes possible the application of power to all four wheels or to the rear wheels only. The low ratio in the transfer case is 2.185 to 1.

The above described engine and power train units give the vehicle (loaded) a high gear grade ability of 5.6 per cent and low gear grade ability of 85 per cent. The low gear ability was achieved through an over-all gear reduction of 187 to 1. Although this grade ability is in excess of that which can actually be used for climbing grades it does provide tremendous torque at extremely slow speeds for starting in deep mud or on muddy inclines. The top speed of the vehicle is 43 mph.

The vehicle has a weight of 15,000 lb (including $2\frac{1}{2}$ -ton payload, but without driver and passenger), or 36 per cent more than the standard Truck, $2\frac{1}{2}$ Ton, 6x6, Cargo, W/Wn. However, only a portion of this weight increase is chargeable to the new design since a part of it is due to the higher power engine and the accompanying increase in size. The maximum mobility of the vehicle over all types of terrain is insured through the use of a system

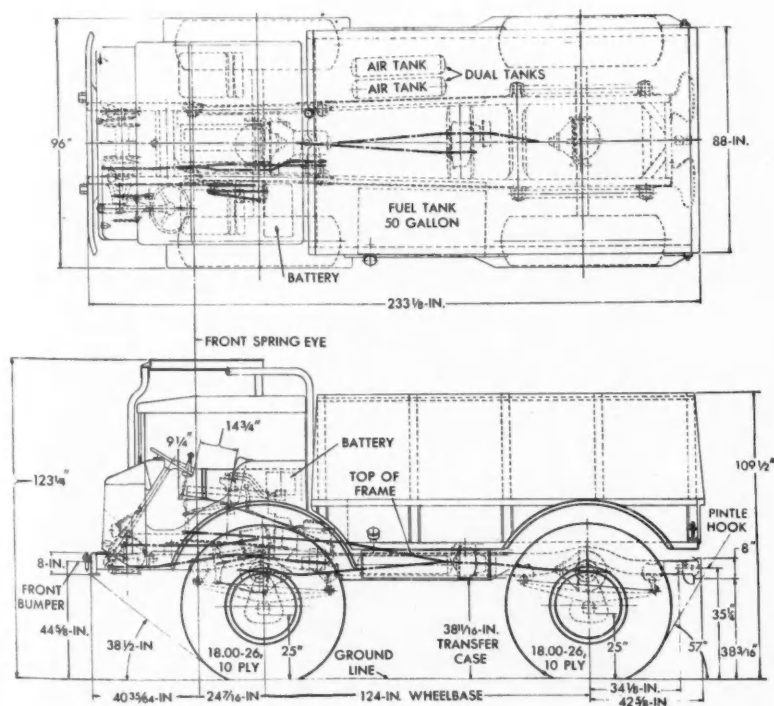


Fig. 1—Dimensional drawing of Army Ordnance T23 Truck

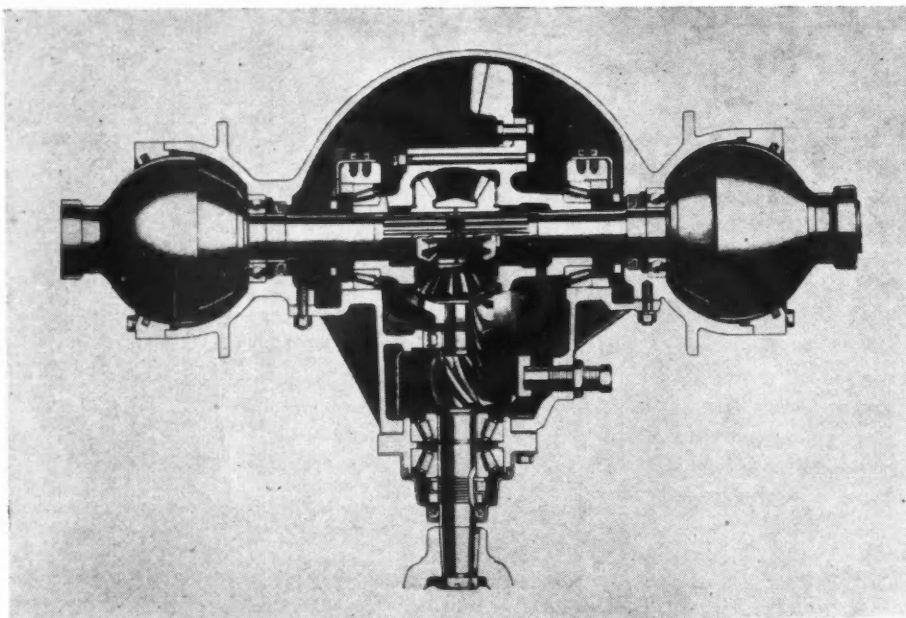


Fig. 3—Sectional view of front axle differential

Each wheel and tire assembly weighs 580 lb. Since the tires are so large and heavy no spare tire is carried on the vehicle. It is contemplated that when punctures occur the tube will be patched at that location. If the tire is damaged a light wrecker crew with another tire will have to be dispatched to the vehicle. A tire alone weighs 300 lb and the tube weighs 40 lb.

Steering is accomplished with a Ross cam and twin-lever design steering gear

assisted by a Bendix-Westinghouse air steering booster which is connected between the steering arm and the drag link. The booster supplies approximately 95 per cent of the steering effort. Steering in the conventional method is possible if the air assist should become inoperative.

The vehicle is equipped with a 12-volt electrical system which is completely water proofed. Without any modification the engine will operate in water up to the depth of the air cleaner or 50 in. For deeper fording, the air cleaner is removed and a vertical rubber hose connected to the carburetor air intake.

which permits the driver to control the air pressure in the tires from his driving position when the vehicle is either moving or stationary. A two-cylinder water-cooled air compressor, which is mounted on the left side of the engine and is driven by a V-belt from the rear end of the generator, automatically maintains air pressure in two large storage tanks. In front of the instrument panel is a control valve unit which consists of a tire inflation valve, a tire deflation valve, and a check valve. The unit, which is connected to the air storage tanks and by a single air line to a group of four manually controlled line valves located at the front of the operator's seat, is operated by a lever on the instrument panel. From the line valves, air lines are connected to the inner end of each hollow wheel spindle. A tire inflation device, attached to the outer end of each wheel spindle and a hose from each inflation device to the tire valve, completes the inflation system. This device was described on page 39 of the Sept. 1, 1945 issue of *AUTOMOTIVE AND AVIATION INDUSTRIES*. A tire pressure gage, connected between the inflation valve and the check valve of the control unit and mounted on the instrument panel, indicates the pressure in each or all tires, depending upon which line valves are open. The recommended tire pressures for different operating conditions are shown on the dial of the tire pressure gage.

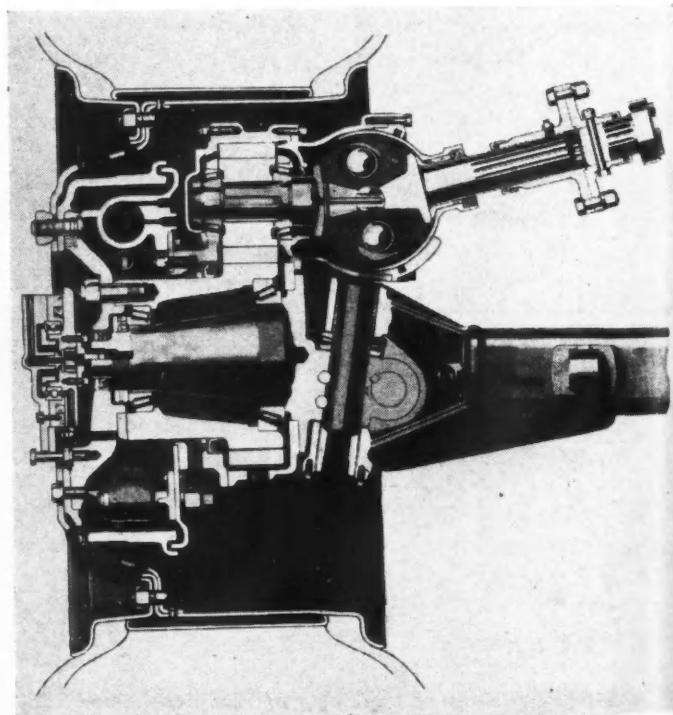


Fig. 4—Sectional view of wheel step-down gear box

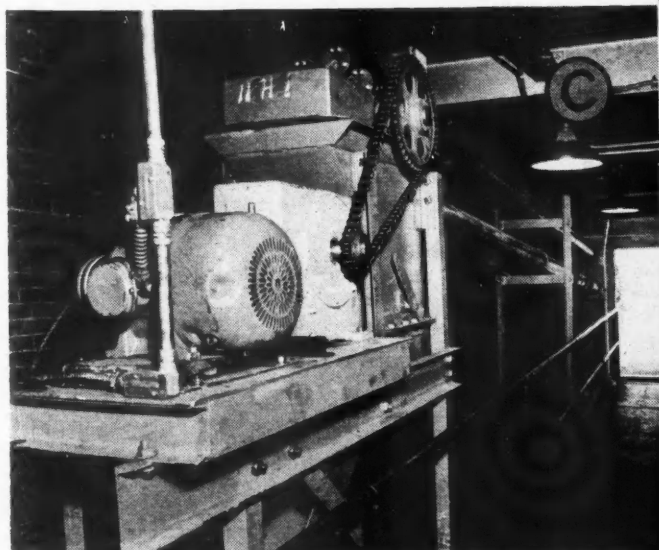
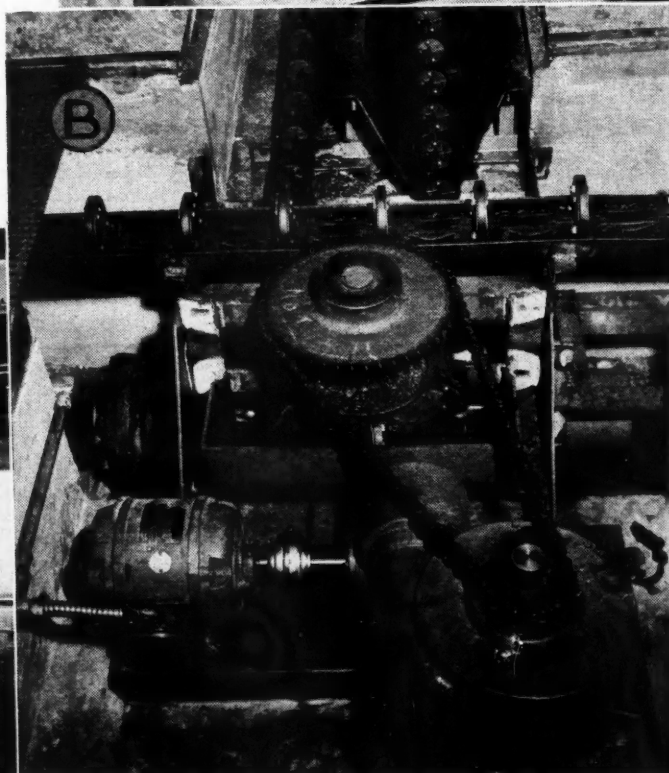
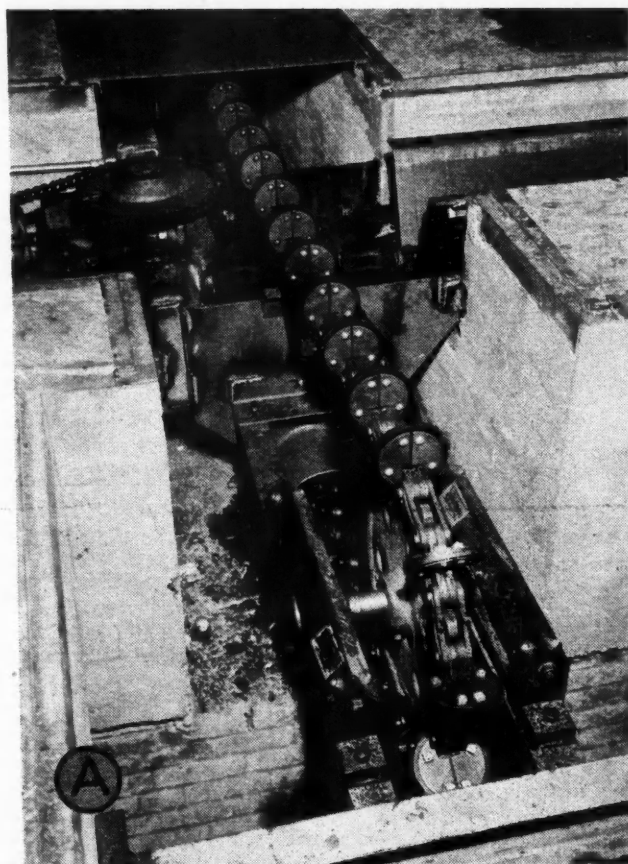
Packard's New Chip Conveyor

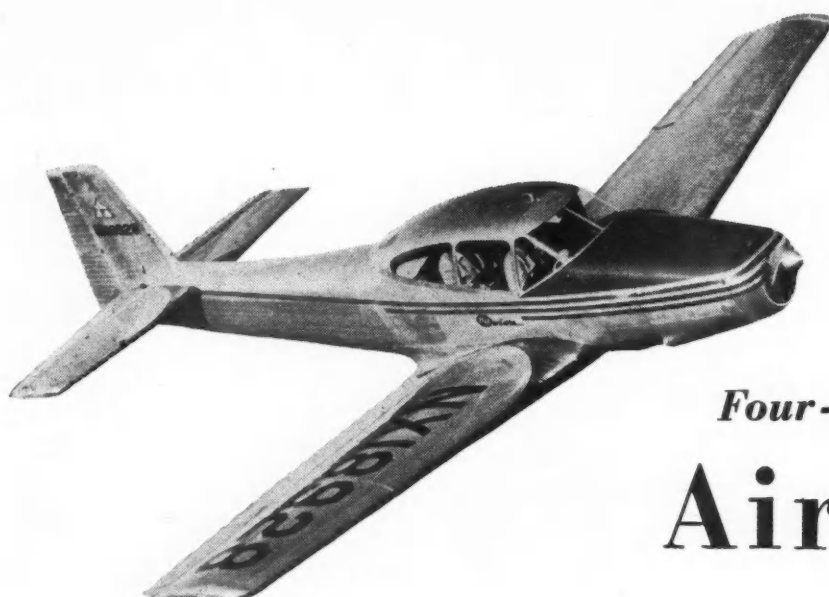
A CHIP conveyor, employing abrasive resisting synthetic rubber pusher disks and virtually noiseless in operation, has just been installed at the Packard Motor Car Co. by Hapman Conveyors, Inc., of Detroit. It extends more than 5000 ft, including both forward and return lengths, through departments machining cylinder blocks, cylinder heads, and exhaust manifolds. Steel chips from 181 machines fall directly through the floor grating covering the conveyor trough and are moved to the briquetting plant for reprocessing. The system includes eleven cross conveyors and fourteen transfer hoppers. Packard requirements called for disposal of 40 cu ft of chips per hr, but it is estimated that capacity can be increased three times without supplementing existing facilities. Elimination of chip piles permits closer grouping of machines and reduction of aisle space. Conveyor link pins are sealed by rubber washers which prevent wear by abrasive dust.

A—The take-up end of the main chip conveyor at Packard, the cross conveyor traveling in an open top trough comes in at the upper right, the transfer hopper being at the end of trough.

B—Floor grating has been removed to show one of the drives of the conveyor. A return is seen in the 6 in. channel that crosses the picture, while a 4 in. feeder operating in an open trough and its channel return can be seen at the top.

C—The lower pipe, shown in this view of the discharge end of the conveyor in the Packard briquetting plant, is 8 in. diameter and the upper one is a 6 in. return pipe.

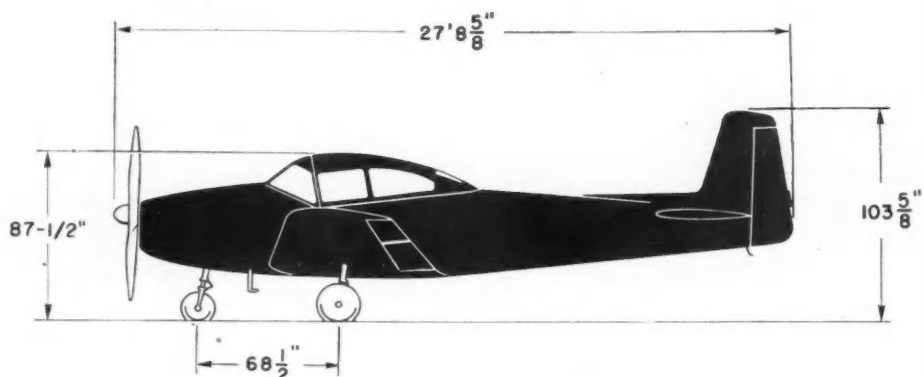




The all-metal Navion. Price
\$6100 Flyaway Los Angeles.

Navion

Four-Passenger Personal Airplane



THE recent announcement of North American Aviation's plans to enter the personal airplane field gave the details of the Navion, a low wing, side-by-side dual control design with a seat for two persons behind the pilot and copilot's seats. Performance figures given in the accompanying table await certification by the CAA, which procedure is already underway. The individual front seats are adjustable and the back seat may be removed to accommodate 435 lb of luggage in 46 cu ft of space.

Navigation lights are installed. Structural design and wiring are provided for installation of landing lights, flares, 2-way radio, additional instruments and cockpit heater which the owner may wish to add. The basic model is equipped with sufficient instruments to meet CAA requirements for contact flight. A landing gear warning horn also is provided, sounding when the throttle is retarded to landing position and the gear is not locked down for landing.



Specifications

Wing span	33.38 ft
Track	98.5 in.
Weight empty	1551 lb
Passenger weight (4)	680 lb
Oil (10 qt)	19 lb
Fuel (40 gal)	240 lb
Baggage	80 lb
Gross weight	2570 lb
Engine...Continental E-185 six cylinder opposed,	
185 bhp, sea level at 2300 rpm with 73 octane fuel	
Maximum speed	160 mph
Cruising speed at 5000 ft (70 per cent power)	150 mph
Most economical cruising speed at 5000 ft (51 per cent power)	115 mph
Maximum range	700 miles
Service ceiling	15,600 ft
Landing speed (flaps 40 deg)	54 mph
Landing distance (flaps 20 deg)	605 ft
Take-off distance (flaps 40 deg)	695 ft
Rate-of-climb (sea level)	830 fpm
Electrical system:	
Generator 12 v, 25 amp capacity	
Battery 34 amp-hr	
Delco-Remy starter	

Close-up of the Navion showing power retractable landing gear. The nose wheel is steerable 20 deg to right or left; the main wheels are equipped with hydraulic brakes.

New Production and Plant Equipment

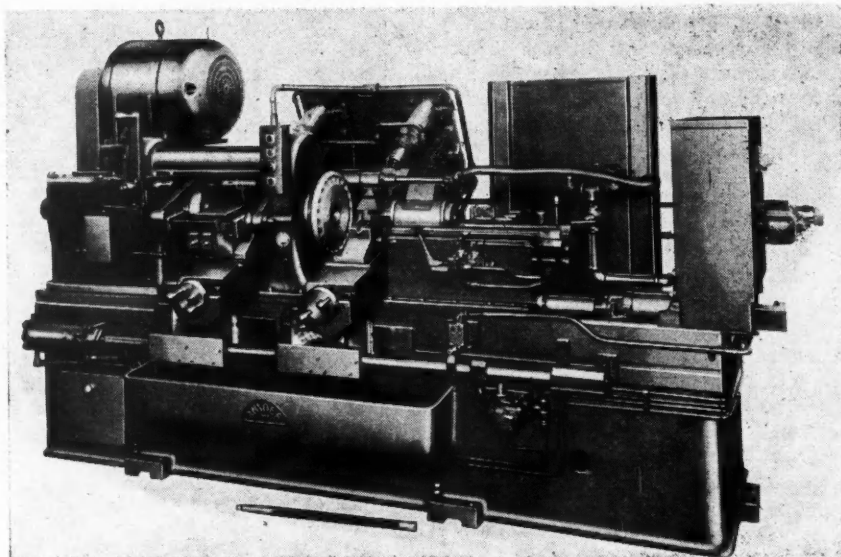
CUTTER shapes involving convex or concave radii, and having straight, tapered, or helical teeth can be resharpened or ground from the solid without the use of special attachments on the Cincinnati Monoset cutter and tool grinder, a product of the Cincinnati Milling Machine Co., Cincinnati 9, Ohio. While the Monoset may be used for conventional resharpening of end mills, reamers, counterbores, form cutters, and a multitude of special tools, it is said to be particularly useful when it becomes necessary to quickly prepare special "trick" or "problem" cutters, special sized drills, etc. The flexibility of machine movements and many built-in features enables most jobs to be performed with a single chucking.

The generation of accurate radii is accomplished by the large turntable base upon which the workhead unit is mounted. The workhead may be swiveled through 235 deg. and adjustable stops are provided to accurately limit its arc of travel. An adjustable transverse slide provides for the grinding of radii which have their centers offset from the centerline of the workpiece.

A feature of the Monoset is the built-in spiral lead mechanism which provides a means of generating right-hand or left-hand spirals having leads as short as 1 13/16 in.



Cincinnati monoset cutter and tool grinder



Snyder center-drive, double-end turning machine

The workhead spindle is provided with a collet chuck, thirteen straight collets ranging from 1/8 in. to 1 1/4 in. diameter, and 6 taper collets. An adjustable tail center support is provided for centered work and adjustable, spring tensioned stock supports are provided for uncentered work.

Indexing of either straight or spiral fluted cutters is provided by a pair of workhead spindle indexing mechanisms. Straight fluted cutters, or other jobs not involving spiral leads, are indexed by a simplified ratchet type indexing device. Indexing of spiral fluted cutters is accomplished by a spring-pressed pawl type mechanism with interchangeable index plates.

Cylindrical grinding is made possible by the workhead spindle motor drive, which is supplied as standard equipment.

SNYDER TOOL & ENGINEERING CO., 3400 E. Lafayette, Detroit, Mich., is building a special center-drive, double-end turning machine equipped with front and rear tool slides. Front tool slides are for turning various diameters and forming a taper on one end. Rear tool slides are for facing, chamfering or undercutting. Center drive has three serrated jaws which grip the part, which is held between centers, without deflection.

The machine operates at the high speed necessary for cemented carbide cutting tools throughout. Production is from 90 to 100 cycles per hour at 80 per cent efficiency.

Loading is manual. The tailstock center, being well out of the way, permits easy loading and is brought in hydraulically by means of a manually operated hydraulic valve. Tool feed is hydraulically actuated through an electrically controlled time cycle.

After loading the machine, the center drive is manually engaged through a clutch lever on the headstock and the part is rotated.

Upon pressing the time cycle starting button, the front tools move into position and travel along the work

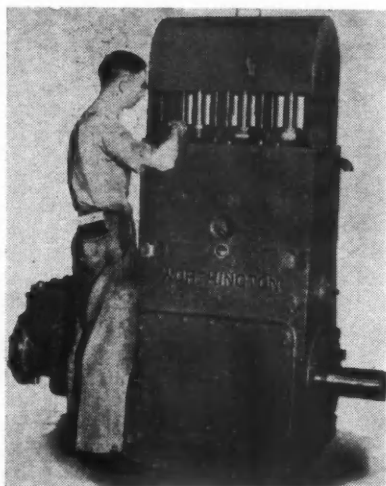
while the rear tool slides come in to do their respective operations.

After the work is turned, the cutting tools drop away from the work and then return to the starting position, avoiding spiral tool marks on the work.

THE Hydraulic Press Manufacturing Co., Mount Gilead, Ohio, announces a new machine for production molding of both natural and synthetic rubber. The H-P-M Turbojector, by means of a motor driven screw, injects rubber into a hydraulically clamped mold. The entire machine cycle is automatic. The H-P-M Turbojector is a completely self-contained unit, the machine base containing H-P-M pumps and valves for controlling all hydraulic actions. The only connections required to put the machine in operation are electric power and cooling water.

The H-P-M Turbojector is designed for molding a wide variety of mechanical parts. Typical examples which have been molded are "O" ring gaskets, rubber bushings and automobile motor mountings.

The driving mechanism of the injection unit consists of a 10-hp, four-speed electric motor and train of gears,



Automatic Variflo pump

directly connected to the injection screw. The rubber in strip, pellets, ribbon or rod form is fed into the injection cylinder by the feed screw. As the rubber advances, the feed screw meshes with a set of specially designed, free running baffle gears, which act as pressure locks. The action of the screw and baffle gears forces the rubber into the nozzle. The frictional heat produced in the injection chamber raises the temperature of the rubber as high as 300° F. Additional heat is secured at the nozzle by employing an electrical resistance band heater. This pre-heating accounts for the rapid curing cycles which can be obtained with the H-P-M Turbojector.

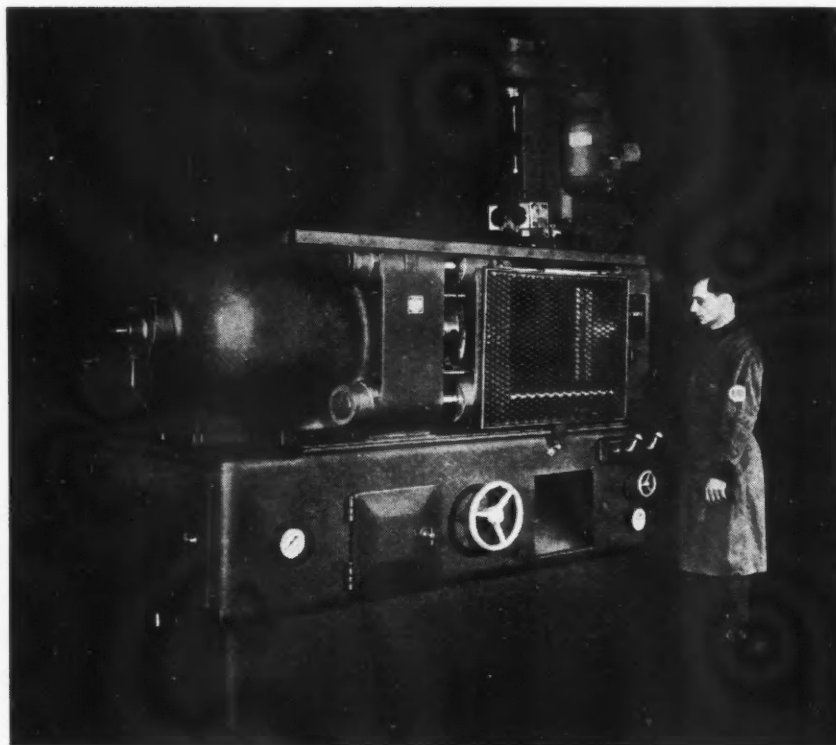
Maximum nozzle contact pressure

during injection is approximately 6000 lb, permitting injection pressures as high as 18,000 psi on the material to be molded. The entire injection unit is pivoted on the stationary mold clamp platen and is hydraulically tilted, thus permitting the nozzle to engage the mold only during injection. To facilitate changing of molds, the injection head can be hydraulically tilted clear of the mold space.

AN IMPROVED variable stroke triplex pump, termed the Automatic Variflo, is now in production by the Worthington Pump and Machinery Corp., Harrison, N. J.

The objectives in the development of the Variflo pump have been the design of a high pressure triplex pump having stepless 0-100 per cent capacity variation. The illustration shows a unit rated for a 75-hp driving motor. Produced as a Variflo pump in identically the same frame as used for the corresponding size of constant stroke pump, it has the same dimensions except for the control cylinder shown on the left of the pump. This space taken by the control cylinder would be allowed as clearance space in any event.

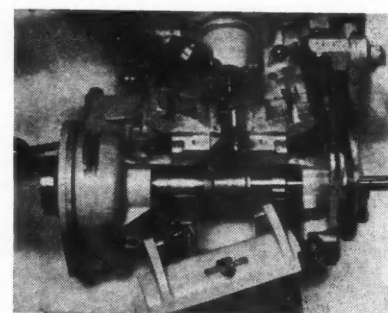
The crankshaft is located at the base, in the fully enclosed frame. Bearings are of the roller type. Positive, automatic pressure lubrication is provided by a direct driven gear oil pump. The Variflo stroke changing elements and other bearings are flooded with filtered oil at all times. The oil pump also provides oil pressure for operating the hydraulic stroke control cylinder.



H-P-M Turbojector

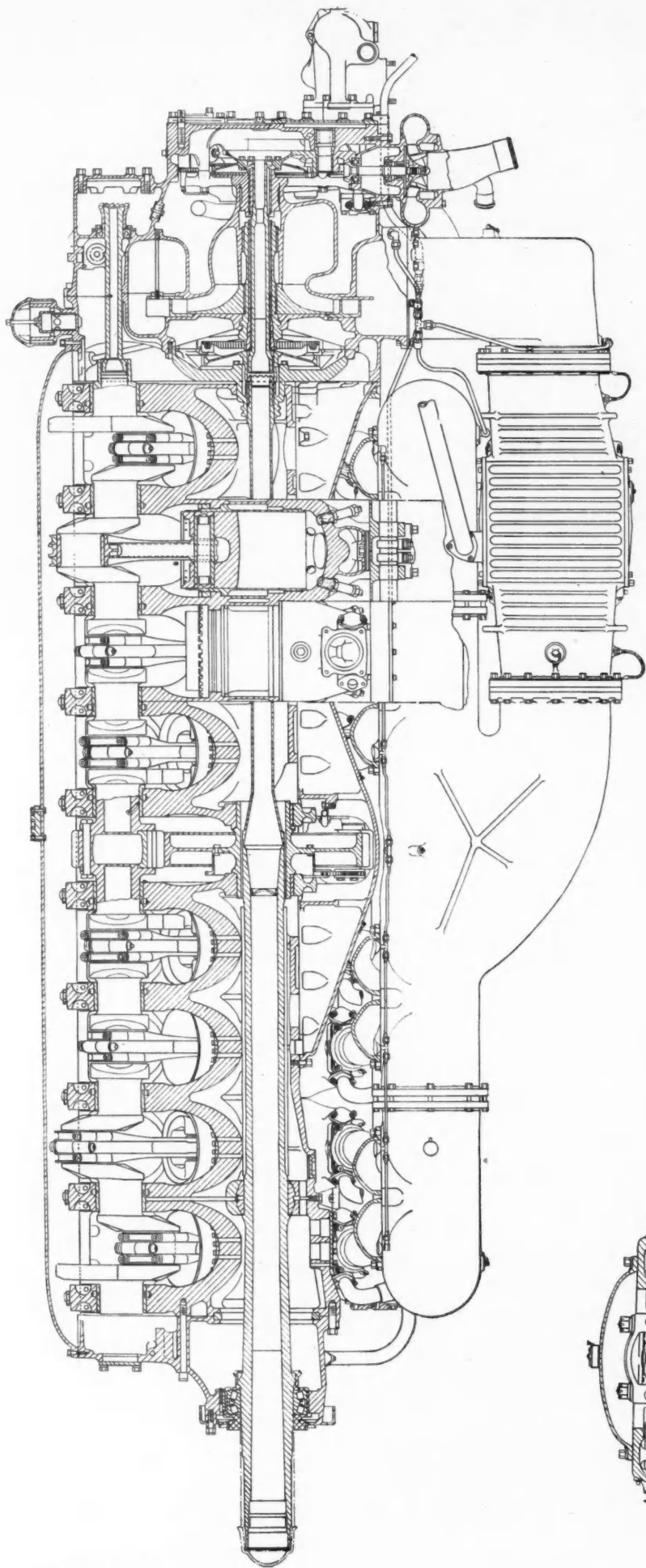
DUNN ENGINEERING CO., Detroit 21, Mich., offers to the trade its "Dunamatic" lathe attachment, for Atlas and Logan lathes. It is claimed that many small parts, particularly those that require only form and cut-off operations, now being produced on automatics, can be produced rapidly, and with equal precision, on the Dunamatic.

This attachment employs face cams to control the operation of rocker arms which, in turn, control the operation of form and/or cut-off tools attached to them. Either circular or flat form tools or a combination of both may be



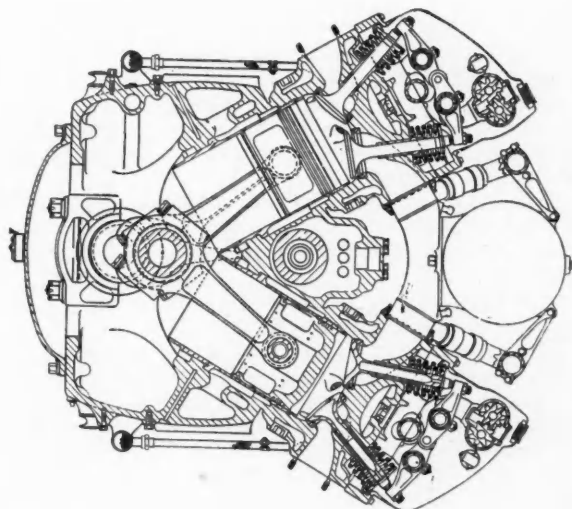
Dunamatic lathe attachment

used, the selection of type depending upon size of the production run. The stock is cam fed through a tube by feed fingers, into a collet, automatically, and a moving stock stop determines the length of the part to be formed and/or cut off. Closing of the collet, which also is an automatic operation. (Turn to page 98, please)



Engineering Drawings of the
Chrysler 2500 Hp
Aircraft Engine

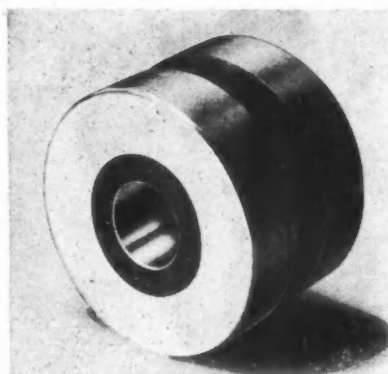
This engine was developed for the Army Air Force and was one of the war secrets until three months after V-J Day. It is an inverted V-16 of unique design and was fully described in an article on page 24 of January 15, 1946 issue of AUTOMOTIVE and AVIATION INDUSTRIES.



New Products

Carbide-Inserted Dies

The Jessop Steel Co., Washington, Pa., is marketing a new line of carbide-inserted compacting dies under the trade name of "Malta." The illustration shows one of 16 inserted carbide dies which have produced over 50 million tablets, with no sign of die wear. This production amounts to approximately 3,500,000 tablets per die. The maker states that these carbide dies have never been reversed, nor have the presses been down because of wear or die failure. In addition to the above advantages, a better surface can be obtained on the tablets, with the elimination of lubricating difficulties.

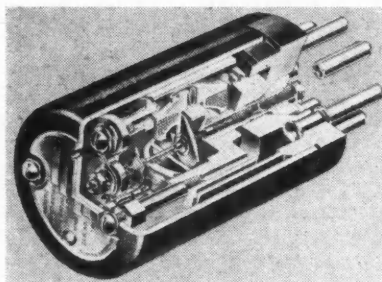


Malta carbide inserted die

Malta carbide dies are now being furnished in sizes from 1/8 in. solid drilled dies, guides, and bushings, to 36 in. inserted drawing dies.

Sensitive Magnetic Relay

Designed and built by the Instrument Division of Thomas A. Edison, Inc., of West Orange, N. J., to meet the exacting requirements of the aircraft industry, the sensitive magnetic relay Model 103 is now available for use in the electronic and industrial fields where relays are required for operation on currents of thermocouple and photocell magnitudes and in equipment where compactness, light weight, and dependability under vibration, are of primary importance. It is said to be particularly useful as a polarized relay in vacuum tube circuits, in balanced circuits, and in applications requiring pull in and drop out at essentially the same current or voltage. In extremely delicate control circuits, this relay can

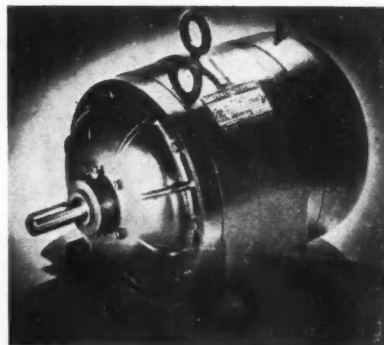


Cut-away view of Edison Model 103 relay

be used to help "shrink" mechanical design by eliminating intermediate amplification. The entire mechanism is protected against weather and dust by a gasketed metal cover and it is balanced to allow operation in any position.

The essential design of the Edison sensitive magnetic relay is an inversion of the d'Arsonval galvanometer type movement in that the permanent magnet swings and the coils are stationary. This feature makes it practical to use bobbin-wound coils containing more wire than usual and thus gives considerable latitude in the selection of resistance values to match associated circuits. Two coils are used which may be connected either in series or differentially so that the relay will operate on the difference between the currents in the two coils.

The contacts will handle 1/3 amp in a non-inductive load circuit; and provide either SPST or SPDT switching. Operating power is normally about 10 microwatts, although for some circuit applications operation may be secured with less than 1 microwatt. The coils will safely dissipate 2 watts, allowing



G-E Tri-Clad induction motor

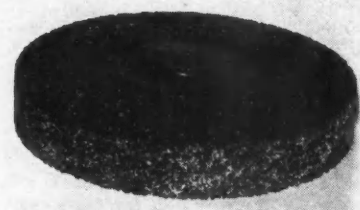
differential operation on large currents while the construction will withstand substantial overloads without damage when used as a simple relay.

Hydraulic Shock Absorbers For Motorcycle Equipment

Two-way, direct-acting hydraulic shock absorbers have been adopted as standard on new models of two leading makes of motorcycles now in production, according to the Monroe Auto Equipment Co., 1411 E. 1st St., Monroe, Mich., the designer and producer. Before the war, motorcycles did not have hydraulic shock absorbing equipment. Mounted between the handle bars and the front axle fork, the new shock absorbers cushion the jar and vibration between the front wheel and axle and the motorcycle frame, including handle bars and seat. This is desirable since the front wheel "meets the bumps first" and the shock thus transmitted to the handle bars ordinarily is felt severely by the motorcycle rider, Monroe engineers explain. The new motorcycle products are the smallest hydraulic shock absorbers ever manufactured by the company.

Dampener Bushing for Portable Grinding Wheels

A vibration dampener bushing is being made by the Manhattan Rubber Division of Raybestos-Manhattan, Inc.,



Manhattan grinding wheel with vibration dampener bushing

Passaic, N. J., for use with Manhattan wheels for portable grinders. The wheels are manufactured in straight types up to eight-in. diameter, for use on electric, pneumatic and flexible shaft grinders. Advantages claimed for this mounting include the elimination of vibration, better finish, less fatigue to the operator, increased production, and lower maintenance cost.

Enclosed, Fan-Cooled Motor Added to Tri-Clad Line

A new totally enclosed, fan-cooled motor, especially designed for use in extremely dusty, dirty, and corrosive atmospheres, has been added to the line of General Electric Tri-Clad induction motors. The new motor is available in standard, explosion-proof, and dust-explosion-proof types from 1 to 1000 hp, and can be used where iron

(Turn to page 46, please)

AUTOMOTIVE and AVIATION INDUSTRIES



Metallurgists and steel-makers review all orders that enter the Inland mill.



Steelmakers Confer With Metallurgists... on every order...at Inland

When an Inland metallurgist is away from his office—and that may be a large part of each day—he can be located in the mill. He may be in a superintendent's office talking processes, he may be at an open hearth furnace following through a heat, or he may be at a mill laboratory getting a record of physical tests.

This close cooperation between steelmakers and metallurgists is an important factor in producing quality steel, in improving processing methods, and in meeting the exact requirements of each Inland customer. Inland Steel Company, 38 S. Dearborn St., Chicago 3, Ill.

Bars • Floor Plate • Piling • Plates • Rails • Reinforcing Bars • Sheets • Strip • Structurals • Tin Plate • Track Accessories

Sales Offices: Cincinnati • Detroit • Indianapolis • Kansas City
Milwaukee • New York • St. Louis • St. Paul

INLAND STEEL

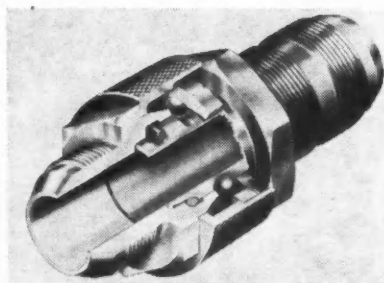
dust and metal filings are in the air and in Class I Groups C and D and Class II Groups E, F, and G hazardous locations. Short in length and compact in construction, the motor can be installed in a small space, making it suitable for machine tool applications where the motor must be part of the driven machine.

The new Tri-Clad features a double-shell, cast-iron frame, and cast-iron end shields and conduit box for protection from external blows, dripping water, dusts, vapors, and corrosive liquids. Sealed end shields and inside joints, and a one-piece, double-shell stator protect windings, punchings and rotating parts from moisture or corrosive elements. Long, close-running shaft fits, supplemented by a rotating seal, keep dirt from entering the motor along the shaft. Punchings and windings within the inner shell of the motor are cooled by a non-sparking external fan which is protected by a cast-iron housing with a screened air-intake opening.

The cast-iron bearing housings are cast integral with the end shields as a barrier to the entrance of foreign materials. An inner cast-iron bearing cap makes a complete enclosure for the bearing. As on all ball-bearing Tri-Clad motors, the pressure-relief greasing system is used. Greasing can be accomplished without disassembling or stopping the motor.

Quick Coupling for Pressure Lines

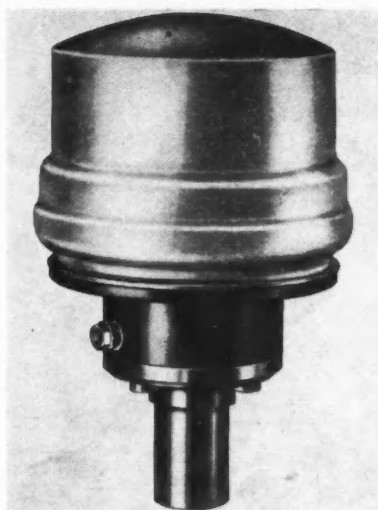
A quick coupling designed for use on hoses and lines operating under pressure has been announced by the Roylyn Mechanical Laboratory, 8928 Santa Monica Blvd., Los Angeles. According to the manufacturer, the new coupling is particularly adapted for hydraulic and pneumatic lines running from pressurized tanks such as truck and



Cut-away view showing cam-ring, ball cage and nipple of quick coupling

trailer connections, fuel lines, paint sprayers and air-driven tools.

Based on the "inclined plane and wheel principle," the Roylyn coupling employs but three major parts: the cam ring, ball cage, and nipple. By rotating the cam collar, steel balls are forced inward into a groove in the nipple clamping the halves together. The gasket retained in the ball cage



Uni-power ignition system

provides a positive seal against dirt as well as being the separating spring force necessary to the operation of the lock. A slight shoulder on the cam assures a positive lock; application of more pressure tightens it, and only the cam collar can unlock it.

Tests made on a model are said to have shown a temperature operating range from -65 F to 300 F with safe pressure limits of 1680 psi for the two-in. coupling and 11,500 psi for the 1/4-in. unit. Couplings are available in aluminum, brass, alloy or stainless steel with correct gaskets to withstand fuels, oils, and acids. Pipe threads or flared tube connections are optional, with caps to fit all sizes of nipples. Standard thread sizes run from 1/4 in. to two in., larger sizes are available on special order.

New Du Pont Resin

A new resin, known as BCM, is announced by E. I. du Pont de Nemours & Co., Wilmington 98, Del. This resin is said to have excellent bonding properties and high resistance to heat.

Plastics fabricators are testing the material to determine its suitability in the manufacture of such diverse products as transparent coatings for wood veneers, tooling jigs, structural panels for automobiles, airplanes, refrigerators, washing machines, etc. Production is still in the semi-works stage.

The liquid resin is used chiefly with glass fabric laminates at present, although it may also be applied to paper, hemp, wood, and various cloths. It requires only a short curing period and low laminating pressure, and can be used as an impregnating and laminating resin either by itself or mixed with a polymer. In the cured state, BCM has no odor and is resistant to most organic materials. Absorption of water, and other common solvents such as acetone and ethanol, is very low, from 1 to 2 per cent.

The new resin is thermosetting. When cast as a transparent sheet on

table tops, it has a permanent high-gloss finish. In addition, thin veneers to which BCM has been applied can be bent without crazing or peeling the resin.

A wide range of colors can be obtained by adding oil-soluble dyes or pigments to the resin. Cast BCM may be worked with high-speed tools easily by the same methods used for methacrylates such as "Lucite" acrylic resin.

Single-Unit Ignition System

"Uni-power," a new unified ignition system for aircraft, automotive, marine and industrial engines, has been developed by the LaPointe-Plascomold Corp., Unionville, Conn.

This new product is a single-unit battery ignition system in which coil, condenser and distributor have been combined in a molded plastic case with high dielectric properties. The complete unit weighs about 2 1/2 lb.

The device features a centrifugal spark advance; optical direction of distributor rotation; easy observation of internal operation while the engine is running; an aluminum cover which protects against dust and moisture and provides radio shielding; spark plug leads from the bottom of housing; and a neon light on the rotor arm to indicate ignition performance.

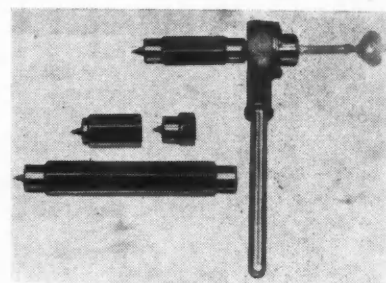
Houghton Announces New Products

Several new products are being offered by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Liquid Heat No. 1550 is a new high heat salt which is rectified by the im-

(Turn to page 76, please)

Ratchet Drill Driver



Techtmann Industries, 714 W. Wisconsin Ave., Milwaukee, Wis., has brought out the new Liberty drill driver. Designed for drilling in restricted spaces, this tool provides positive feed at each turn of the drill bit. The compact head allows centering of holes within 1 1/4 in. of the nearest obstruction. Any standard wood bit can be used. Steel drills can be used with an adapter chuck. Although intended primarily for use on wood members, steel plates or beams can also be drilled by reducing the feed, which can be done by revolving the lead nut in the same direction as the drill.

AUTOMOTIVE and AVIATION INDUSTRIES

BETTER SURE THAN SORRY

According to olden legend Icarus flew too near the sun, only to spin in when his wings failed to stand the stress at high temperature. Here was an early case of serious trouble due to misplaced confidence in materials.

There are many applications for steel nowadays where creep strength (the ability of steel to keep working when the heat is on) makes a

tremendous difference. Molybdenum steels, being noted for their creep strength, are economical preventives of high temperature trouble.

Icarus had no accurate data on materials to guide him. A wealth of tested, practical facts about Molybdenum steels for elevated temperature service is available on request for today's engineers and designers.



MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
500 Fifth Avenue, New York City

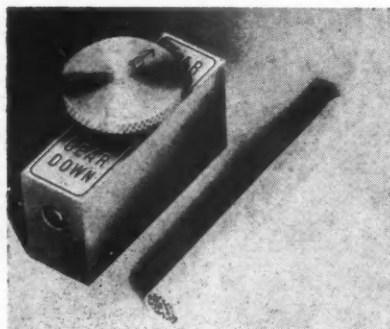
New Products for Aircraft

Remote Control for Hydraulic Equipment

Air Associates, Inc., Teterboro, N. J., have just completed a system for the remote control of hydraulic equipment. Called the Hydro-Switch system, the arrangement is composed of either a small panel or pedestal mounted switch and a new type valve located near the equipment to be moved, or a switch with valve located integrally in the actuating cylinder. Weight for the entire Hydro-Switch system is said to be extremely low.

The new device is different in that it does not depend on pressure for operation, but utilizes hydraulic flow to provide an all-hydraulic system. Only two lines, plus a small drain line connected to the nearest hydraulic return, provides four-way operation.

The Hydro-Switch system is said to provide for absolute control of the de-



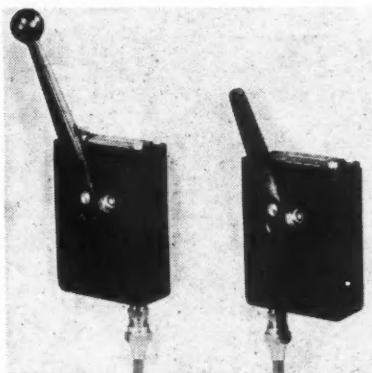
Air Associates Hydros witch

vice being operated at any desired position. It does not prevent sequence operation of equipment. The system is not limited to any particular operating pressure. It can be used in any of the three standard aircraft systems of 1000, 1500 or 3000 psi pressure, as well as at higher or lower ranges.

Small, Light-Weight Hydraulic Control

An almost miniature hydraulic remote control, the smallest of its type and weight yet offered to the aviation market, has been developed by Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J. Numerous applications are possible, but those most frequent are throttle, mixture, governor, and all sorts of position indicator controls. A

single flexible copper tube is used, the system is completely enclosed, and the installation is accomplished with but three small bolts for each of the two

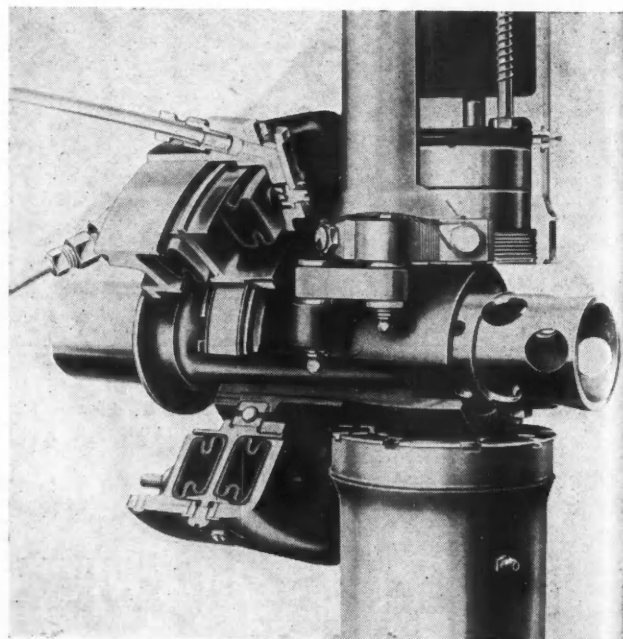


Sperry miniature hydraulic remote control

pieces which make up the complete unit.

Transmitter and receiver, made of bronze, together weigh 3.7 lb. Any motion of the transmitter arm will be duplicated by the receiver arm. Either arm will move through an arc of 60 deg., and the receiver arm may be drilled at any location to obtain the desired linear travel of the actuating rod.

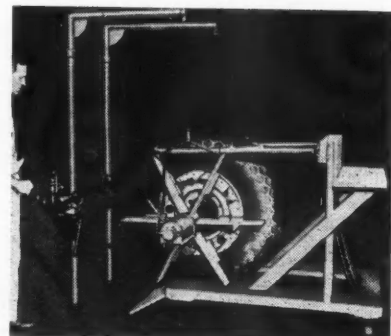
Cut-away view of Continental hydraulic controllable pitch propeller



Power Operated Equipment For Changing Tires

The Wats Manufacturing Enterprises, Miami, Fla., have brought out two new types of equipment for changing airplane, truck, and bus tires.

The Tirematic hydraulic press is so designed that it frees the beads from



Tirematic hydraulic press

the rims of either drop-center or split-rim wheels while the wheel is upright on the dolly.

According to the manufacturer, the Tirematic manual tire-changer has been used to make complete changes of large size airplane tires within 17 minutes. A smaller size of the manual tire-changer is also being manufactured for tire repair shops and service stations.

Hydraulic Controllable Pitch Propeller for Light Planes

Continental Aviation and Engineering Corp., Muskegon 82, Mich., has started production and shipments of its first new post-war product, a hydraulic controllable pitch propeller for light

(Turn to page 96, please)

**FOR
LEAK-PROOF, PRESSURE-TIGHT
ASSEMBLIES**



**USE PERMATEX FORM-A-GASKET
on NEW gaskets...and on OLD gaskets!**

Form-A-Gasket No. 1 (a paste) sets fast but not too fast for use on large surfaces. It dries hard but never becomes brittle. It's a swell product for making pressure-tight, leak-proof, permanent unions even when surfaces are warped.

Form-A-Gasket No. 2 (a paste) sets a little slower than No. 1. It dries to a tough, pliable layer with plenty of "cushion". It resists high pressures and very readily disassembles.

Aviation Form-A-Gasket No. 3 (a heavy, brushable liquid) sets itself into position and dries to a tacky paste. It will not run even when heated to 400° F. Nor will it become hard or brittle at temperatures down to 70° below zero. It's a great, all-around product!

**ALL TYPES OF FORM-A-GASKET
PRESERVE ALL TYPES OF GASKETS!**

**PERMATEX COMPANY, INC.
BROOKLYN 29, N. Y., U. S. A.**

Shortages of Parts and Steel Retard Production of New Cars

**Continued Coal Strike Could Be Disastrous to Manufacturers
Studebaker Only Maker to Abandon 1946 for 1947 Models**

Anyone charged with predicting the immediate future of automobile production has to deal with confusion, speculation, governmental whimsey, and a host of slippery nimble-footed facts which blow hot and cold daily. The plain truth is that every manufacturer is uncertain about some segments of his supply line and none will paint a very optimistic picture. Since V-J day, the industry has been pretty well trampled over by a parade of troubles, and reconversion to anything resembling a break-even point has been heart-breakingly slow. If it was not labor trouble in the car builders' own plants, it was suppliers' strikes that upset their well-laid plans. Other complications were shortage of materials and inability to get labor productivity back to normal.

Sheet and Strip Steel Serious Bottleneck

Today there are many disconcerting elements facing the industry supply-wise, but the most important single worry is sheet and strip steel. This was apparent even before the coal strike hit, and if that stoppage proves to last three or four weeks, the results will be disastrous to continued car production. Some companies are better off than others, so far as inventories are concerned, but none of them is in too good a position. Ford was compelled to curtail operations for a week starting April 4 because the supply of steel was not adequate to meet sharply mounting production schedules. The suspension of operations in several departments of the Rouge and Highland Park plants and in branch plants throughout the country was designed to build up operating inventories.

Parts Shortage Closes Hudson Assembly Lines

Hudson Motor Car Co. also halted assembly lines late in March because of a parts shortage caused by a strike at Midland Steel Products Co. in Cleveland, which supplies frames. This company provides a good example of the supply difficulties which are keeping production creeping. For several months

after Hudson started turning out cars last fall, production ran from 300 to 350 a day. With the start of the second line a few weeks ago, output edged up to about 400 a day, but at that point leveled off and remained fairly static. There were not enough parts available of all categories at one time to push much beyond the 400 mark. The same principle applies to Ford. Following resumption of manufacturing early in March, production climbed rapidly to well over 3000 a day. However, at that point supply problems set in, principally steel, causing the partial shut-down.

G.M. and Packard Accumulate Parts During Strike

General Motors divisions are better off than most companies, since they did accumulate some little inventory during the strike. The same is true of Packard. However, the advantage will be temporary, since after the first few weeks the steel backlog will be reduced, and it will be in order to start scratching for enough to keep going. Packard started production of cars about the middle of this month, after being idle since late January.

Prolonged Coal Strike would Sharply Reduce Production

In general, it is the feeling in Detroit that car production for the next several weeks will be a series of spurts and lags as supply conditions ebb and flow. The trend will be ever upward but the curve will rise slowly, marked with frequent dips from day to day and week to week as bottlenecks are met and broken. In the event of a prolonged coal strike, of course, production would dub off sharply after three to four weeks, and altogether eventually.

Studebaker Only Maker to Bring out 1947 Models

In view of foreseeable difficulties ahead, there has been little reaction in Detroit to the Studebaker announcement that 1947 models will be coming off the lines by the first of May. So

far, there has been no indication that any other company intends to abandon 1946 models in favor of 1947 cars. While no official comment has been forthcoming, one spokesman says that the economics involved in changing from the present model run, which has not yet reached the break-even point, will govern any future action. He points out that from the competitive angle, there is no need to make a switch to 1947's now because dealers can sell all of the current models they can get. Studebaker has not revealed its reasoning behind the decision to make the switch at this time. About the most logical one advanced by observers is that the company's supply of parts built up during the prolonged delay in getting started last year has been about run through, and that with supply difficulties ahead, it was considered advantageous to go ahead with change-over tooling rather than continuing spotty production, meanwhile using the down time to build a new inventory.

Latest Equipment and Tooling Displayed at New Era Exposition

Designed to demonstrate the latest ideas in equipment and tooling, leading to cost economy, the New Era Exposition held in conjunction with the Fourteenth Annual Meeting of the American Society of Tool Engineers opened auspiciously at the Cleveland Public Auditorium on April 8. Some 350 exhibits attracted an attendance estimated at around 35,000 tool engineers, production executives and other interested people.

Perhaps the largest percentage of exhibits was devoted to cutting tools of high speed steels, proprietary hard alloys, and various makes and types of cemented carbides. This category, too, included a variety of small tools of quick-removable types so essential to low cost operation. Another large group included offerings of pneumatic and electric portable tools for assembly operations. Quality control came in for unusual attention with displays of gages, gage blocks, instruments, and electronic devices for precision measurement. Manufacturers of small machine tools, bench type drills, abrasive saws, lathes, hydraulic presses and special machinery, were well represented. Included in this group were exhibits of the Swedish Lidkoping centerless grind-

(Turn to page 88, please)



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WITH THE INDUSTRY'S
FINEST FACILITIES

*Rough inspection,
every casting
is examined
carefully
for defects.*

TODAY Sealed Power's factories, laboratories, and personnel have reached a 35-year peak. The organization whose leadership has been recognized by leading automotive engineers since 1911 is now ready to serve you with the finest facilities in all its history. You are urged to utilize the full resources of Sealed Power to make your good engines even better.



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SEALED POWER PISTON RINGS
PISTONS—CYLINDER SLEEVES

Keep Your
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Get \$4 for \$3!

CALENDAR

Conventions and Meetings

Natl. Plastics Exposition, New York City	Apr. 22-27
Amer. Management Assoc. Production Conf., New York	Apr. 22-24
International Lighting Exposition, Chicago	Apr. 25-30
The Chamber of Commerce of the United States—Annual Meeting, Atlantic City	Apr. 30-May 2
American Foundrymen's Assoc. Foundry Congress and Show, Cleveland	May 6-10
Natl. Assoc. of Corrosion Engineers, Kansas City, Mo., Annual Meeting and Convention	May 7-9
Associated Business Papers, Hot Springs, Va., Spring Meeting	May 22-25
Amer. Iron & Steel Institute, New York Mtg.	May 23
Assoc. of Battery Manufacturers, Spring Mtg., Cleveland	May 22-24
Indianapolis Motor Speedway Race, Indianapolis	May 30
SAE Summer Meeting, French Lick, Ind.	June 2-7
Amer. Soc. of Mechanical Eng.—Detroit	June 17-20
SAE Natl. West Coast Trans. and Maint. Meeting, Seattle	Aug. 22-24
SAE Natl. Tractor Meeting, Milwaukee, Wis.	Sept. 11-12
Instrument Society of America, 1st Natl. Show, Pittsburgh	Sept. 16-20
SAE Natl. Transportation and Maintenance Meeting, Chicago	Oct. 16-17
SAE Natl. Fuels & Lubricants Mfr., Tulsa	Nov. 7-8
American Welding Society Annual Meeting, Atlantic City	Nov. 17-22
Natl. Metal Congress and Exposition, Atlantic City	Nov. 18-22
SAE Natl. Air Transport Engineering Mfg., Chicago	Dec. 2-4

Truck Industry Celebrates Its Golden Jubilee Year

The motor truck industry, like the passenger car industry, is celebrating 1946 as its Golden Jubilee year, for the first reported sale of a motor truck as well as of a passenger car was in 1896.

Plans of motor truck makers for the Golden Jubilee events include participation in the dinner celebration May 31 at Detroit's Masonic Temple in honor of automotive pioneers, and in a special "motor truck section" of the Detroit Motorcade of Progress parade June 1. In addition to a showing of historic trucks to demonstrate progress over the years, there will be a display of the many and varied commercial uses of motor vehicles, from delivery of milk to drilling of oil wells and searching for gold.

After the parade, a representative collection of old as well as new trucks will be shown at the Antique Automotive Exposition to be held from June 1 to 8 in Detroit.

Carpenter Steel to Build Research Laboratory

To provide facilities for developing new and improved steels, and for maintaining exacting control over high quality tool, stainless and alloy steels, the Carpenter Steel Co. has announced plans for a new research laboratory.

Ground has been broken at the company's mills in Reading, Pa., for the new three-story structure. Plans for the first floor include experimental melting and rolling equipment, a heat treating department, machine shop and physical testing laboratories. The second floor will be occupied by a complete metallographical laboratory, equipped with special apparatus for the study of problems affecting the behavior and performance of tool steels, stainless steels, magnetic steels and nickel alloys. The third floor will accommodate a chemical laboratory including the most advanced equipment for experimental spectrographic work. In addition, the plans include conference rooms and a well-equipped library.

Ford Transfers Truck and Bus Production

All Ford Motor Company truck and bus production in the Detroit area is being moved from the Rouge plant in Dearborn to the Highland Park plant. Ford will spend more than \$2,000,000 to accomplish the transfer. Buses are expected to be rolling off the new line by mid-summer and trucks by mid-October. The move will add 2500 employees to the 10,500 already employed at the 200-acre Highland Park plant.

The company's plans to double production of Ford and Mercury passenger cars, station wagons and Ford trucks in Detroit area plants are said to have prompted the decision to locate truck production at Highland Park and passenger car and station wagon production at the Rouge plant "B" building.

Supplementing Your Statistical Issue

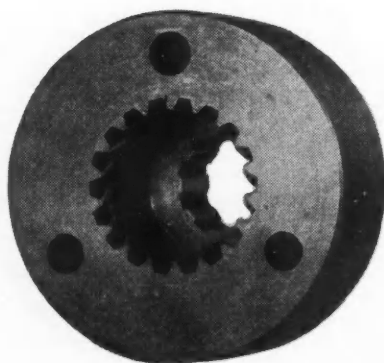
On page 105 of the March 15, 1946 (Statistical Issue) of AUTOMOTIVE AND AVIATION INDUSTRIES, the make of automatic choke used on 1946 passenger cars is shown for all makes of cars so fitted with the exception of Chrysler, De Soto, and Dodge. We have now been informed by their manufacturers that these three cars have Sisson automatic chokes made by the Pierce Governor Co.

On page 80 of the March 15, 1946 (Statistical Issue) of AUTOMOTIVE AND AVIATION INDUSTRIES, the truck registrations for the State of Michigan are given as 123,406. Additional information lately received from the Secretary of State of Michigan raises that figure to 167,214 and brings the U. S. total to 4,812,979.

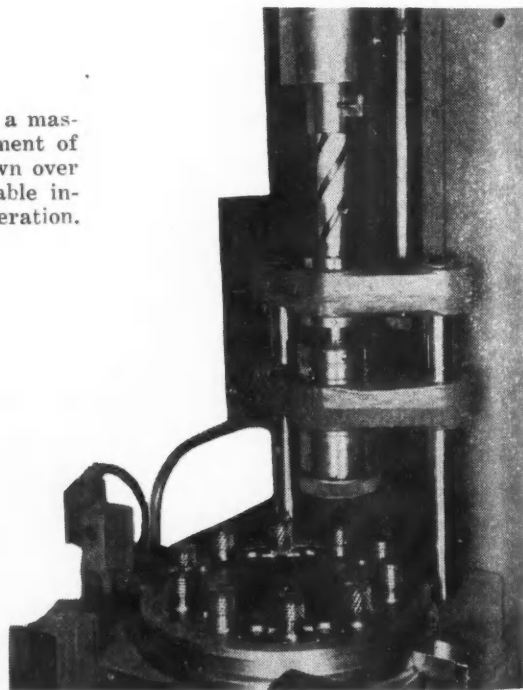
Broaching Blind Holes

THE Colonial Broach Co., Detroit, recently completed an installation for broaching helical splines in a blind hole in a transmission part, the design being that the tool cannot pass through the work. A recess is undercut beyond the section of the part to be splined for broach clearance at the end of the cut. Ten short broaches, each with five sets of cutting teeth, are mounted on an indexing table and the part is held in the

moving ram head that contains a master lead bar actuated by movement of the ram. The part is moved down over each broach successively, the table indexing automatically for each operation.



At right is shown machine set-up for broaching, and transmission part with internal helical splines.

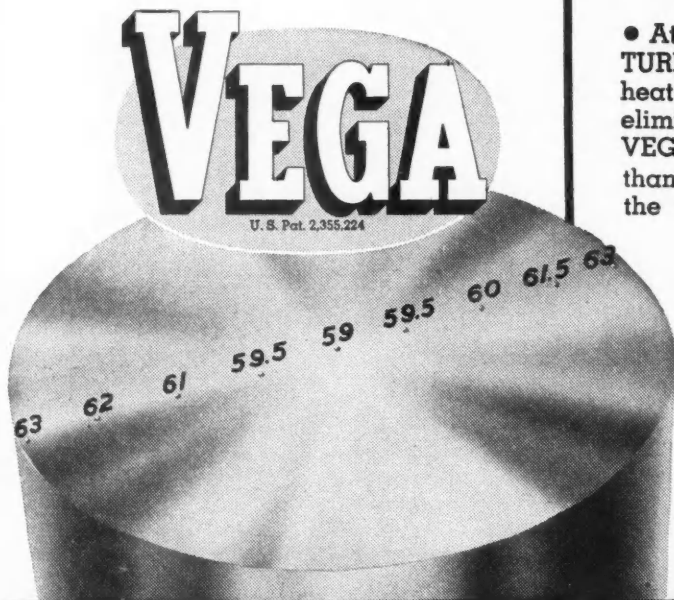


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EASY LOW TEMPERATURE HEAT TREATMENT

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Inside Rockwell "C" Hardness Of Section Cut Midway On 8" Round x 15" Long VEGA, Air Cooled At 1550°F, 1 Hour At Heat.



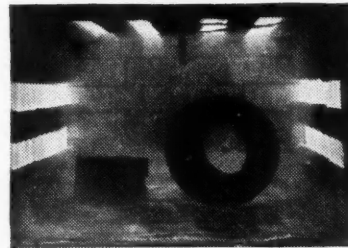
Carpenter

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TOOL STEELS

100% ACID-DISC INSPECTED

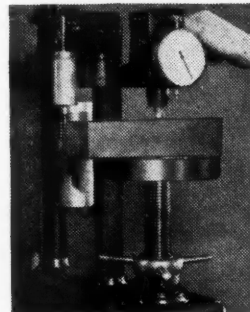
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UNIFORM HARDENING IN VERY HEAVY SECTIONS

• By combining the deep-hardening characteristics of air-hardening steels with the simplicity of low temperature heat treatment, VEGA can save you many costly hours spent in heat treating. Notice the uniformity of Rockwell hardness values from surface to center of this 8" VEGA round. Let VEGA prove its versatility on many of your jobs such as blanking, piercing, trimming and forming sheet metal in light and heavy gauges—jobs where minimum distortion and size change and uniform hardening in very heavy sections are required.



- Minimum Distortion and Size Change
- Resistance to Decarburization
- Freedom from Excessive Scaling in Hardening
- Good Machinability
- High Degree of Toughness with Good Hardness to Resist Shock and Wear



Take your first step now and put these advantages to work in your tool room. Drop us a note on your company letterhead, asking for the new

VEGA Folder. It contains complete information on VEGA—its properties, heat treatment and use.

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OAKITE

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**CLEANING of
DIE
CASTINGS**

Producers and users of die castings know the high importance of **CORRECT** surface preparation before applying organic or other finishes either for corrosion prevention or appearance.

Since die castings may be of aluminum, zinc, magnesium, brass, bronze, copper, tin or lead, the **RIGHT** cleaning or degreasing material should be selected for **EACH** metal to remove thoroughly all buffing compounds, oil, grease, shop soil. Because in **EACH** case the **RIGHT** material assures better results, faster, more effective cleaning and **LOW** unit cost.

Send for FREE Digest

Producers and users of die castings are invited to take advantage of the wide range of specialized Oakite materials designed for cleaning die castings, and of our 37 years' successful cleaning experience. A new Oakite Digest discusses this important subject, describes cost-cutting methods used by many plants. Write for your **FREE** copy today.

OAKITE PRODUCTS, INC.
28A Thames Street, New York 6, N. Y.
*Technical Service Representatives Located in All
Principal Cities of the United States and Canada*

OAKITE *Specialized*
CLEANING
MATERIALS • METHODS • SERVICE

OPA Sets Prices for Most of GM's Cars

Ceiling prices for Pontiac, Oldsmobile, Buick and Cadillac 1946 passenger automobiles have been announced by the Office of Price Administration.

Effective April 11, 1946, the new price ceilings will apply to all sales of these cars until necessary adjustments are made to reflect increased factory costs due to recently approved wage rate increases. The increases which take into account wage and material cost increases up to fall of 1945 apply for the most part to cars which were manufactured some time ago and now are in dealer's hands.

The retail prices reflect an absorption by dealers of 2½ per cent of their pre-war initial margins. Because these car prices do not reflect recent factory wage increases, the additional two per cent dealer absorption recently announced by OPA to cover these increases is not included in the price schedules. These prices, F.O.B. factory, do not include excise taxes, transportation, or preparation and handling charges.

	1946 retail prices	1942 retail prices
Pontiac		
Series 6 LA Torpedo 6		
chassis	\$ 689	\$...
business coupe	957	888
sport coupe	995	928
sedan coupe	1,032	...
convertible sedan		
coupe	1,229	1,158
2-door sedan	1,007	933
4-door sedan 6 window	1,057	978
Series 8 LA Torpedo 8		
chassis	713	...
business coupe	980	913
sport coupe	1,019	953
sedan coupe	1,055	...
convertible sedan		
coupe	1,252	1,183
2-door sedan	1,031	958
4-door sedan 6 window	1,080	1,003
Series 6 LB Streamliner 6		
chassis	743	...
sedan coupe	1,061	970
4-door sedan	1,120	1,025
Series 8 LB Streamliner 8		
chassis	767	...
sedan coupe	1,084	995
4-door sedan	1,144	1,050

Oldsmobile		
Series 66:		
chassis	\$ 760	\$...
club sedan	1,052	...
club coupe	1,036	948
convertible coupe	1,264	1,173
4-door sedan	1,090	993
Standard 76:		
chassis	864	...
club sedan	1,108	1,000
4-door sedan	1,165	1,055
DeLuxe 76:		
club sedan	1,200	1,085
4-door sedan	1,257	1,140
Standard 78:		
chassis	911	...
club sedan	1,155	1,040
4-door sedan	1,212	1,095
DeLuxe 78:		
club sedan	1,247	1,125
4-door sedan	1,304	1,180
98 Series:		
chassis	991	...
convertible coupe ..	1,561	1,440
club sedan	1,326	1,210
4-door sedan	1,368	1,265

Buick		
40-Series:		
chassis	\$ 839	\$...
4-door sedan	1,173	1,110
Sedanet	1,125	1,065
50-Series:		
chassis	954	...
special chassis	916	...
4-door sedan	1,369	1,270
sedanet	1,301	1,220
convertible coupe ..	1,559	1,440
estate wagon	1,755	...
70-Series:		
chassis	1,156	...
special chassis	1,012	...
4-door sedan	1,593	1,455
sedanet	1,513	1,385
convertible coupe ..	1,795	1,665

Cadillac		
61 Series:		
5-passenger club coupe 2-door	\$1,588	\$1,440
5-passenger sedan 4-door	1,689	1,520
62 Series:		
5-passenger club coupe 2-door	1,779	1,535
5-passenger convertible coupe 2-door ..	2,006	1,870
5-passenger sedan 4-door	1,838	1,620
60 Series:		
5-passenger sedan 4-door	2,447	2,255
75 Series:		
5-passenger sedan 4-door	3,440	3,062
7-passenger sedan..	3,592	3,212
7-passenger imperial	3,753	3,357
9-passenger business sedan	3,321	2,917
9-passenger imperial	3,479	3,062
163 inch commercial chassis	1,480	...

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of **AUTOMOTIVE AND AVIATION INDUSTRIES**. In making requests give title above the item concerning the publication desired, the date of issue in which it appeared, your name and address, company connection and title.

Copper Alloy Welding

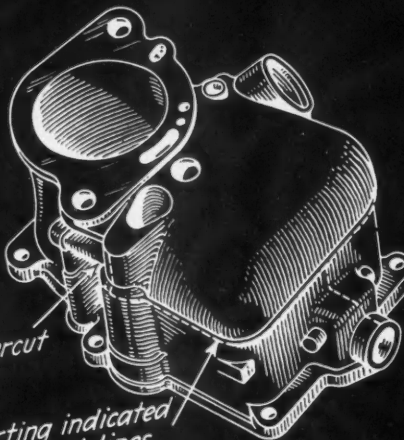
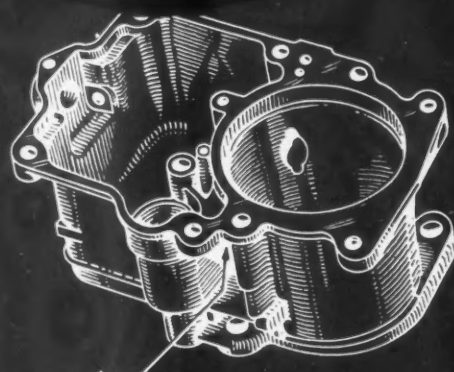
C. E. Phillips & Co.—32-page handbook of procedures and materials, entitled **Welding and Brazing of Copper and Copper Alloys**. The first section includes definitions of materials and processes, accompanied by a table of compositions and properties of the most commonly welded and brazed commercial copper alloys; general information regarding the welding characteristics of

these materials, suggestions for preparing parts for welding, etc. The second section contains descriptions of each of the common copper alloys, information on composition, physical properties, forms usually supplied, etc. The third section is devoted to welding and brazing materials for copper and copper alloys and the general plan of treating each material separately is followed.

(Turn to page 56, please)

When writing to advertisers please mention **AUTOMOTIVE and AVIATION INDUSTRIES**

DESIGNING FOR DIE CASTING



UNDERCUTS

In designing die castings, undercuts (recesses in casting walls) are usually avoided since they necessitate slides or "knockout" cores in the die and thereby increase production costs. There are occasions, however, when undercuts can be completely justified, as in the die casting here discussed:

The designers of the illustrated zinc alloy die cast carburetor body were anxious to minimize the amount of metal required per casting since the production run on this part is very large. Considerable metal was eliminated through the use of the undercuts indicated on the drawing, and this saving easily offset the extra die cost involved in providing slides. Furthermore, the undercuts made sec-

tion thickness of the casting more uniform, which is highly desirable because uniformity of section tends to avoid unequal shrinkage.

There are also cases where interior undercuts, of the type requiring loose cores ("knockouts"), are justified even though the time of the casting cycle is increased and the die cost is higher. *There is no logic, however, in employing undercuts of any kind when they provide no compensating advantages.*

Additional data on undercuts will be found in our booklet "Designing For Die Casting." To insure that you will get the most from your die casting dollar, ask us—or your die casting source—for a copy of this booklet.



ZINC

FOR DIE CASTING ALLOYS

THE NEW JERSEY ZINC COMPANY • 160 Front St., New York 7, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are based on
HORSE HEAD SPECIAL ($99.99+\%$) **ZINC**
Uniform Quality

Publications

(Continued from page 54)

Dryseal Pipe Threads

The Weatherhead Co.—8-page booklet on Dryseal Pipe Threads containing information explaining what dryseal pipe threads are, how they work and recommended practices. Included also are charts and drawings of interest to engineers, designers and purchasing agents.

Hard Surfacing Method

Metal & Thermit Corp.—A new technical bulletin covering hard surfacing and the use of Hardex Electrodes in building up surfaces for resistance to

shock and abrasion. Helpful information concerning such factors as effect of temperature and cooling rates on deposited metal, selection of proper grade of rod and recommended welding techniques is given.

Stainless Steel Bellows

Chicago Metal Hose Corp.—12-page booklet entitled C.M.H. Stainless Steel in Bellows. Diagrammatical cross-section views and up-to-date information concerning the use of stainless steel bellows as equalizers, compensators, expansion joints, flexible connectors, etc., for flow control, vapor and steam traps. are included together with specifications charts and other data of special

interest to engineers and product designers.

Variflo Triplex Power Pumps

Worthington Pump and Machinery Corp.—Bulletin W-414B50 describing the company's Automatic Variflo Triplex Power pumps. The bulletin is illustrated and contains a sectional drawing showing pumping and control mechanism and a chart of sizes and ratings.

Diesel Engine Lubrication

Petroleum Advisers, Inc.—New booklet on Diesel engine lubrication. Information included covers the Diesel operating principle, fuel injection systems, combustion chamber design, fuel quality, lubrication, lubricating systems, oil recommendations, lubricating problems and solutions. Many illustrations are given, including line and cross-section drawings showing design and structural details. An Appendix includes operating hints, a trouble chart, table of conversion factors, etc., and a 1946 lubrication chart for Diesel engines.

Eaton Products

Eaton Manufacturing Co.—Pocket-size booklet on its products. Included are illustrations of valves, coil and leaf springs, rotary pumps, lock washers, etc., together with descriptions of each product.

Universal Joints

American Gear and Manufacturing Co.—New folder on its universal joints. Construction features are covered and a table included giving standard catalog numbers, specifications and prices.

Replacing Stripped Threads

Aircraft Screw Products Co., Inc.—Bulletin No. 300, Heli-Coil System for Replacing Stripped Threads, contains illustrated instructions for installing Heli-Coils in tapped-thread repair work; as well as specifications and part numbers of the accessory tools recommended for use with Heli-Coil Inserts for American National and spark plug tapped threads.

Profilometer

Physicists Research Co.—New catalog on the Profilometer, giving information and suggestions on the quality control of surface finish and on the designation of surface finishes on prints and specifications. The Profilometer and all accessories and attachments are described and their applications pointed out. Complete specifications and prices are given for each unit. Illustrations showing equipment in use are included.

Spring Clutches

L. G. S. Spring Clutch Corp.—Folder on spring clutches describing the principle of operation and the general types of clutches.

Dust Control Equipment

American Air Filter Co., Inc.—Bulletin 270-A on Roto-Clone dust control contains many installation photographs, tables, charts and a discussion of a simplified procedure for designing a Roto-Clone exhaust system.



- Buell Air Horns are tops in warning signal efficiency.
- Installed as original equipment on many Trucks and Buses.
- They reduce maintenance costs by decreasing stops, starts and slowdowns.
- All records prove that they save tires, brakes, clutches and gears.
- Cut gas and oil consumption.

With a Buell the driver has greater security, maintaining a steady cruising speed. Slowing a 20 ton load from 50 MPH to 30 MPH means destroying a lot of energy thru brake lining and tires. It is replaced by burning more gasoline, increasing load on engine, and tires again, to regain speed. This all costs money. We believe a Buell Air Horn is worth \$100.00 yearly on any heavy highway vehicle. Then remember a Buell will last more than 10 years. How would you rate a \$100,000 investment that earned \$100.00 yearly for 10 years. Ask the man who has a Buell.

BUELL AIR COMPRESSOR

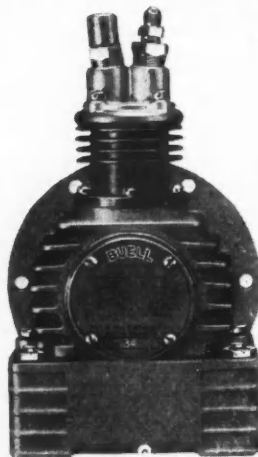
- Used on Passenger Cars, Trucks, Buses, Boats and Planes.
- Small and compact in size . . . efficient and powerful in action.

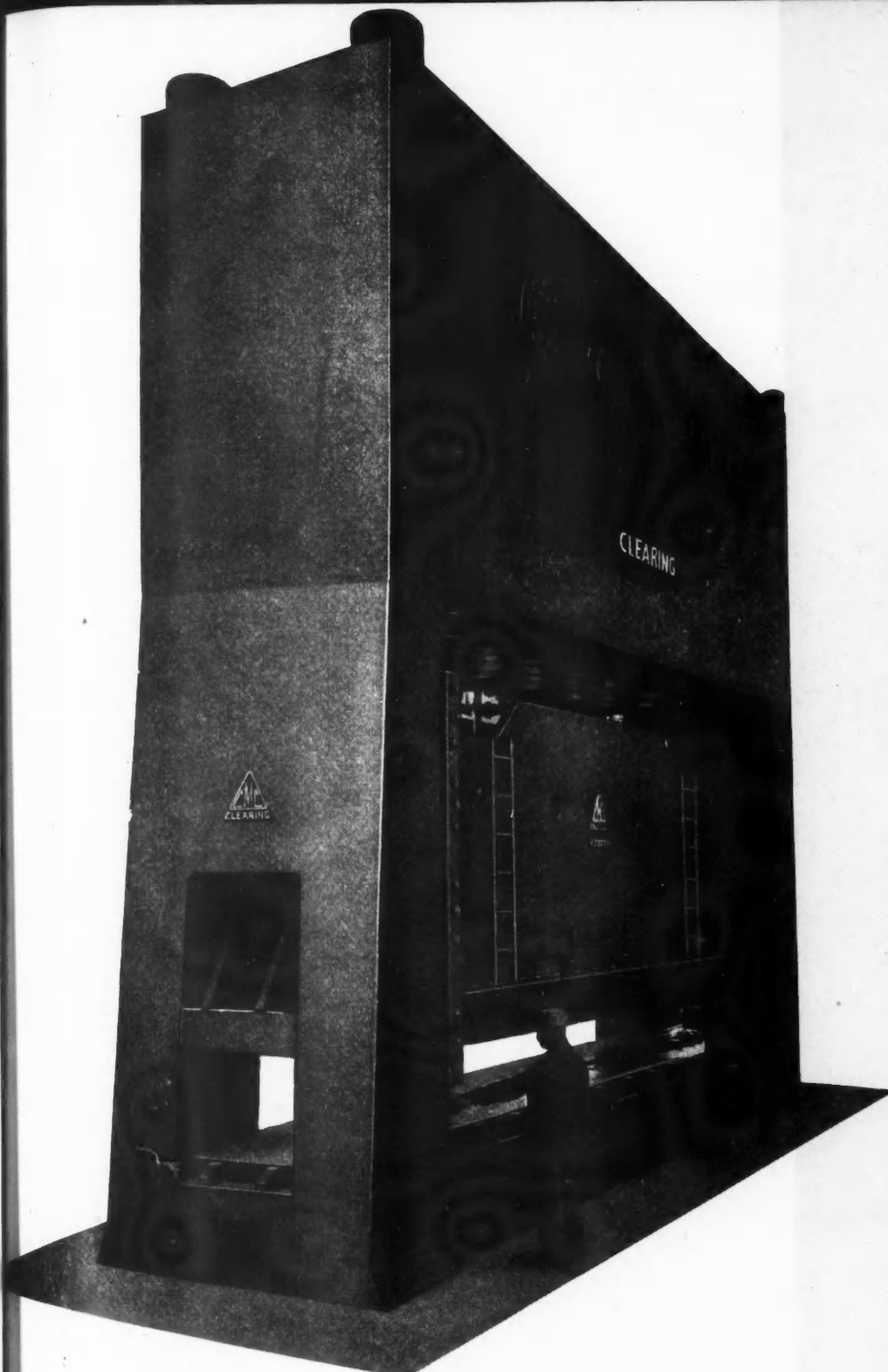
Buell engine-driven compressors supplied air to operate air brakes in thousands of R.C.A.F. aircraft. Only a combination of quality and precision workmanship could meet the requirements of this type of service.

Designed for compactness and light weight, they are far more efficient and powerful than their size indicates. Let us prove their adaptability to your needs.

BUELL MANUFACTURING CO.

2975 Cottage Grove Ave., Chicago 16, Ill.





RAIL PRESS

- 72" x 380" BED AREA
- 3000-TON CAPACITY
- 7½ SECONDS
PER STROKE CYCLE

This huge Clearing Mechanical Press represents something more than the biggest press of its type in the world. Size alone is important only in meeting the dimensional specifications of the parts you wish to produce.

Like size, tonnage capacity is again only a basic factor in meeting the physical requirements of the work to be done. Building this Clearing Rail Press with a 3000-ton capacity was not of course a commonplace task... but Clearing has already built presses of other types up to 6000-ton capacity. If work should demand them, Clearing Presses of greater capacities could be built just as well.

Clearing can always supply easily your press requirements in size and pressure. The important point to remember is that Clearing engineering can take your press design problem and go well beyond basic specifications... and give you operating speeds and precision results that provide tangible manufacturing advantages. For example, the Rail Press illustrated provides an operating speed that is approximately 33⅓% faster than other known presses of this type and size.

Therefore when press equipment is required, it will pay to call in Clearing. Clearing's approach to press design plus Clearing experience can be your assurance always of a quality press to do your work faster and better, at lower cost.

CLEARING MACHINE CORPORATION
6499 West 65th St. Chicago 38, Ill.

CLEARING DESIGN FOR FASTER BETTER PRODUCTION



- 1 Modern, compact overall design. Clearing Eccentric Drive gives precision movement to the slide... permits slide adjustment over a wide range. Drive is fully enclosed and runs in oil... provides long life, minimum maintenance, and safety.
- 2 Operating speed eight stroke cycles per minute... 22" stroke, 14" slide adjustment.
- 3 Bed area 72" x 380"... designed for forming truck, bus, and trailer chassis rails.
- 4 Bed contains six triple and two double pneumatic die cushions.

CLEARING MECHANICAL AND HYDRAULIC PRESSES



for FORMING • DRAWING • BLANKING • FORGING
also Pneumatic and Hydropneumatic Die Cushions
Automatic Feeds • Accumulator Systems

Engineered for the Job

PERSONALS

General Motors Corp., Chevrolet Div., Charles J. French, Advertising Manager; J. S. Clark, Asst. Advertising Manager, and Myron E. Scott, Asst. Advertising Manager in charge of special events.

Chrysler Corp., Plymouth Div., Arthur B. Dowd, Merchandising Manager.

Chrysler Export Corp., George V. Candler, Jr., Manager, Market Research Dept.

Nash Kelvinator Corp., Nash Motors Div., W. A. Cook, Manager of Commercial Dept. in Charge of Fleet Sales. H. M. Lowe, Technical Adviser, and J. B. Huntress, Asst. Sales Promotion Mgr.

Willys-Overland Motors, Inc., Aircraft Div., B. R. Sherrell, retirement announced.

The White Motor Co., Henry N. Vreeland, Asst. Director of Purchases.

Ford Motor Co., R. E. Elliott, Supt. of Ford's Twin City Branch in St. Paul.

Kaiser-Frazer Corp. and Graham-Paige Motors, W. E. Mack, Asst. to

Vice-President in Charge of Engineering; Fred Lord, Director of Purchases, and Roger F. Mather, Chief Metallurgist.

Kellett Aircraft Corp., Walter E. Lucie, Executive Asst. to R. G. Kellett, Executive Vice-President and Treasurer.

Beech Aircraft Corp., Howard E. Wainscott, Chief Inspector.

Lear, Incorporated, Jean H. DuBuque, Advertising and Public Relations Director.

Timken Roller Bearing Co., Walter F. Green, Asst. Mgr., Div. of Research and Development; Joseph M. Roshong, Supt. of the Div.

Foote Gear and Machine Corp., Charles U. S. Grant, Sales Engineer, Cleveland.

E. I. duPont de Nemours & Co., Auto Finishes Div., R. C. Peter, Technical Representative, Toledo area.

The Bunting Brass & Bronze Co., Charles E. Bunting, elected Chairman of Board of Directors; George H. Adams, President, and Walter F. Volk, Secretary and Treasurer.

Bullard Co., E. C. Bullard, elected President; E. P. Bullard, elected Chairman of the Board of Directors.

Bliss & Laughlin, Inc., Harry M. Clarke, Asst. to the President.

Gabriel Company, Miss B. G. Quigley, Export and Car Factory Sales Executive; W. Bruce Johnston, Advertising and Sales Promotion Manager; J. A. Crawford, Asst. Manager of Distributor Sales, and John Ready, Sales Engineer.

ACF-Brill Motors Co., Turner A. Duncan, Asst. to Irving B. Babcock, Chairman of the Board of Directors.

Borg-Warner International Corp., John W. DeLind, Jr., President, with headquarters in Chicago.

Pennsylvania Salt Manufacturing Co., Alexander J. Cassatt, elected a director; H. L. Crowder, Traffic Manager, has announced his retirement.

United States Rubber Co., Richard A. Denby, Manager of Distribution Planning Dept., U. S. Tires.

General Tire & Rubber Co., A. J. Teusch, Director of Industrial Relations for all General Tire plants.

American Brake Shoe Co., American Brakeblok Div., C. Q. Smith, Sales Asst. to the president, and Fred J. Kelly, Mgr. of Replacement Sales.

The General Detroit Corp., Robert Leggat-Weir, Asst. Sales Mgr., and Preston W. Wolf, Asst. Sales Promotion Mgr.

Insuline Corp. of America, Alfred S. Chambers, Advertising Manager.

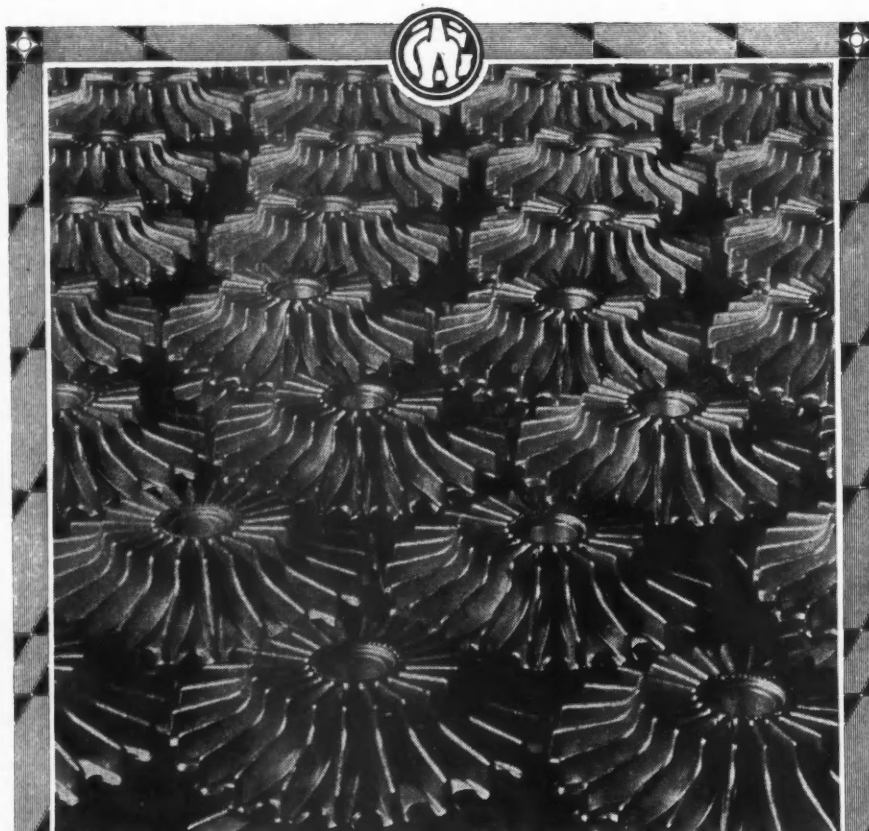
Ramsey Corp., W. M. Marien, Chief Engineer, and Charles Marien, Sr., Director of Engineering.

The Bristol Company of Canada, Ltd., Charles Webber, Managing Director.

Jessop Steel Co., Harry Wilson, Jr., 1st Vice-President.

P. R. Mallory & Co., Inc., Dr. F. R. Hensel, elected vice-president in charge of engineering.

(Turn to page 60, please)



Typical of many light alloy forgings made by Wyman-Gordon during the last fifteen years — aluminum impeller forgings for aircraft engines.

The Wyman-Gordon range of forgings is limitless, not only in the production of forgings of aluminum, magnesium and steel, but in forging development.

WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel

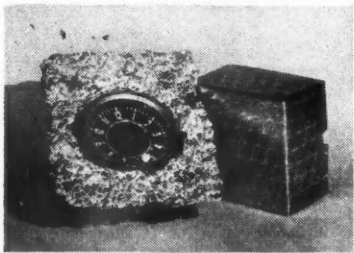
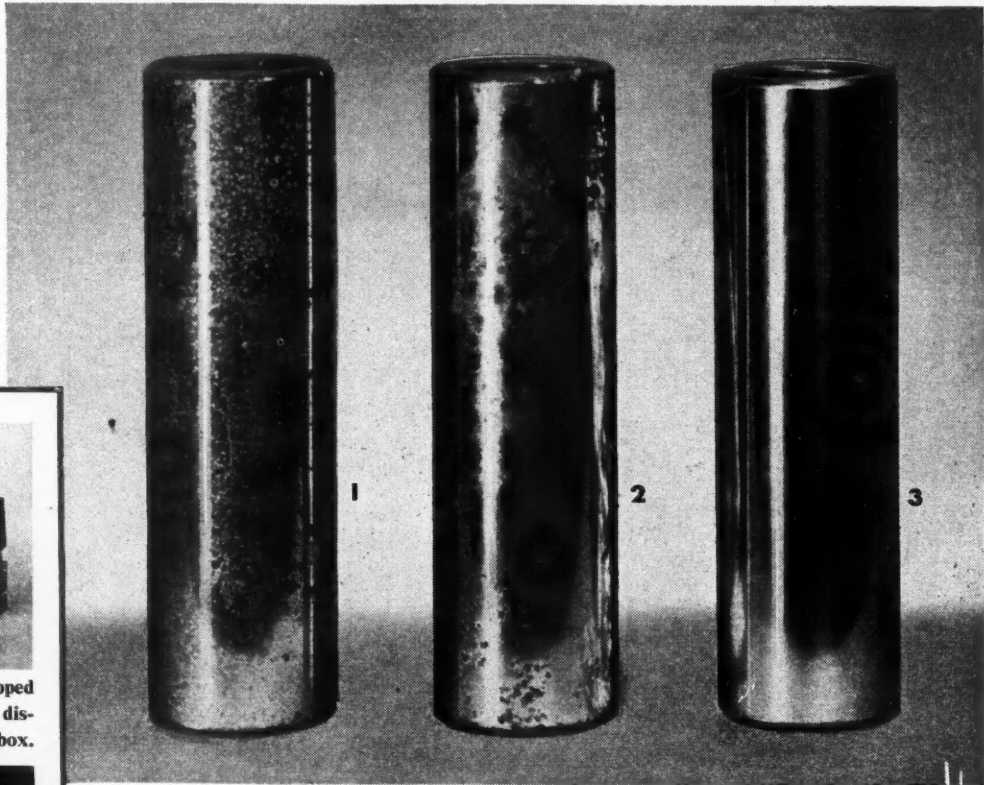
WORCESTER, MASSACHUSETTS, U. S. A.

HARVEY, ILLINOIS

DETROIT, MICHIGAN

New Corrosion-proof Protection

Three Piston Pins were subjected to the same test: a 100-hour humidity test with 100 per cent humidity at 95° F. No. 1, unwrapped with no preservative showed considerable rust after 25 hours. No. 2, dipped in AXS-674, a light oil with rust inhibitor showed slight traces of rust after 25 hours. No. 3, after dipping in AXS-674 and wrapping in Reynolds Aluminum Foil, showed no signs of rust even after 100 hours.



Electrical Automobile Clock—Wrapped in corrosion-proof aluminum foil and displayed in attractive embossed foil box.



Intake Valves—Each valve individually wrapped in aluminum foil. Extra display value obtained by placing in foil carton.



Spark Plugs—Aluminum foil, as an intimate wrap, safeguards against corrosion...adds "buy" appeal.

plus sparkling sales allure

HERE is a revolutionary new method of packaging, developed to safeguard metal parts sent overseas under severe moisture conditions. Today this same method of packaging brings greater protection than ever before to countless civilian products...spark plugs—piston rings—bearings—valves...and many other metal parts.

Greater display value
Reynolds Aluminum Foil used

for packaging, adds a gleaming luster to the product that enhances sales appeal...brightens stock on display...makes for greater sales and faster turnover. Perhaps your product can benefit from the new advances made in packaging metal parts.

For complete, up-to-the-minute data on the many new uses for aluminum foil, write to the Reynolds Metals Company, Richmond 19, Virginia.



REYNOLDS METALS COMPANY

Leads the way in Foil Packaging

M. W. Kellogg Co., M. W. Kellogg, Chairman of the Board; H. R. Austin, President; F. E. Johnson, Vice-Chairman of the Board, and L. H. Harvison, Executive Vice-President.

Fenwal, Inc., Edward J. Poitras, Director of Engineering, and John M. Storkerson, General Manager, elected directors of the company.

Cogsdill Twist Drill Co., S. A. Cogsdill, elected Chairman of the Board; Floyd Cogsdill, elected President, and C. B. Stoerkel, Sales Manager.

The Heil Company, Joseph F. Heil, elected President, and Julius P. Heil, Director and Treasurer.

The Federal Machine and Welder

Co., Henry A. Stix, Executive Vice-President.

Thermoid Company, Dwight P. Allen, Executive Vice-President.

Harry Ferguson, Inc., new directors elected are Horace D'Angelo, Secretary and Treasurer; Harry D. Myers, Vice-President in Charge of Production, and Charles R. Vincent, Asst. to the President, Roger M. Kyes.

The Bunnell Machine and Tool Company, R. J. Swing, General Sales Manager.

The American Welding & Manufacturing Co., C. L. Miller, Purchasing Agent.

Eaton Manufacturing Co., Stamping

Div., Clarence A. Morris, Chief Chemist. Surface Combustion Corp., Milton E. Meske, Development Engineer at Columbus plant.

Detrex Corp., W. F. Newbery, national accounts manager.

Aeronautical Products, Inc., Charles Gross, Vice-President in charge of Sales.

Business in Brief

Written by the Guaranty Trust Co., New York. Exclusively for AUTOMOTIVE and AVIATION INDUSTRIES

The renewed expansion of general business activity has continued. The *New York Times* index for the week ended March 23 stands at 132.6, as compared with 131.1 for the preceding week and 143.8 a year ago.

Sales of department stores, as reported by the Federal Reserve Board, for the week ended March 23 rose slightly to a total 12 per cent above the corresponding distribution in 1945, as against a like advance of 13 per cent recorded for the week before. Sales in 1946 so far reported show a rise of 16 per cent from the comparable sum in 1945.

Electric power production during the week ended March 30 registered a moderate decline. The output was 7.8 per cent below the comparable amount last year, as compared with a similar recession of 8.7 per cent reported for the preceding week.

Railway freight loadings during the week ended March 23 totaled 801,606 cars, 0.6 per cent more than for the week before but 1.5 per cent below the corresponding number a year ago.

Bituminous coal and lignite production during the week ended March 23 totaled 13,175,000 net tons, slightly less than the output in the week before but 11.5 per cent above that a year ago. The production during 51 weeks of the coal year that began April 1, 1945, was 4.6 per cent less than the corresponding 1944-45 output.

Civil engineering construction volume reported for the week ended April 4 by *Engineering News-Record* is \$130,993,000, slightly less than the preceding weekly figure but 289 per cent greater than the amount registered a year ago. The fourteen-week total shown for 1946 is \$1,111,276,000, or 168 per cent more than the comparable sum in 1945. The increase shown for private construction is 546 per cent, and the advance in public projects is 42 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended March 23 was unchanged at 108.4 per cent of the 1926 average, as compared with 105.1 a year ago.

Member bank reserves declined \$89,000,000 during the week ended March 27. Underlying changes thus reflected include a rise of \$480,000,000 in Reserve bank credit and a gain of \$623,000,000 in Treasury deposits with Federal Reserve banks, accompanied by a reduction of \$47,000,000 in money in circulation.

Total loans and investments of reporting member banks declined \$323,000,000 during the same week. A decline of \$27,000,000 in commercial, industrial and agricultural loans was recorded. The sum of these business loans, \$7,464,000,000, shows a net increase of \$1,376,000,000 in twelve months.

Uncontrolled cooling results in excess sludge, crank case dilution, motor wear and waste of gas and oil. Control curbs all of these and gives a lift in performance. That's why automotive designers have made it standard practice to

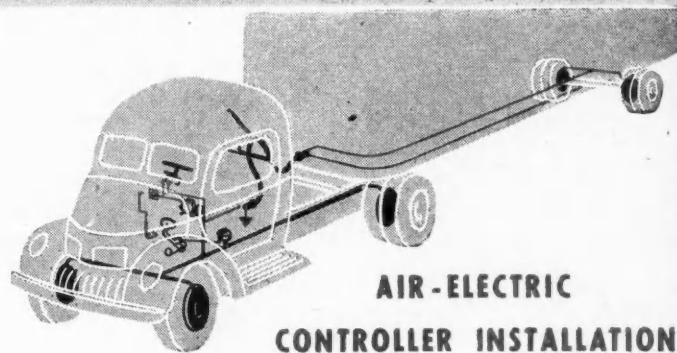
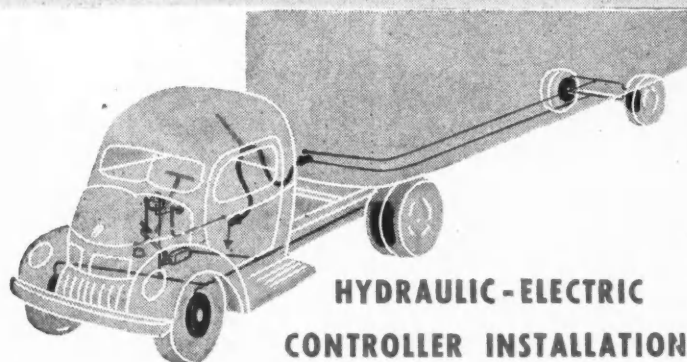
Put a Bridle on the Cooling System



THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue, Chicago 12, Illinois
Los Angeles Detroit Philadelphia

BRAKE ACHIEVEMENT...

**Synchronizes Either Type of Tractor Brakes
with Trailer Electric Brakes
so Foot Pedal Operates ALL Brakes Together**



*Controller is easily and quickly fitted
into tractor's hydraulic brake line.*

*For tractors with air brakes, the Con-
troller installation can be made with
equal speed and ease.*

**FOOT PEDAL PRESSURE
CONTROLS BRAKES ON
Both TRACTOR AND
TRAILER**



WARNER
ELECTRIC BRAKES

HARRIS

COMPRESSED-RUBBER JOINTS

USED IN SHOCK ABSORBERS

A typical application of Harris COMPRESSED-RUBBER Joints is at the ends of direct-acting shock absorbers as applied to automobiles, trucks and railway coaches.

Other applications of these COMPRESSED-RUBBER Joints are in spring shackles, radius rods and many other types of links and lever arms which embody oscillating joints.

Harris COMPRESSED-RUBBER Joints require no lubrication, operate noiselessly and practically without wear, cushion shocks and absorb vibration. They are applicable to all sorts of equipment and we have supplied industry with millions of these joints.

If you have a wear or noise problem in connection with any oscillating joints, we welcome the opportunity to furnish the answer.



HARRIS PRODUCTS CO.
CLEVELAND 4, OHIO, U. S. A.

Nash Purchases Plant in West Coast Area

Nash-Kelvinator Corp. has purchased a plant at El Segundo, Cal., for the production of Nash automobiles and trucks and Kelvinator appliances. It will serve the entire western seaboard region.

The new plant will supplement Nash-Kelvinator facilities in Michigan and Wisconsin. Operations are scheduled to start late this fall and it is contemplated that full operation will furnish employment to more than 2400.

The new Nash plant is located on a 30-acre site and was purchased for an undisclosed price from the War Assets Corp. Built in 1944 by the Defense Plant Corp., it was operated during the war by North American Aviation, Inc. It is situated at the south boundary of the Los Angeles Municipal Airport on Imperial Highway near Sepulveda Boulevard. Recently appraised at \$1,835,000, it has 475,000 sq ft of floor space consisting of factory, cafeteria and office buildings.

Willys Announces Two Sedans and Station Wagon

James D. Mooney, chairman of the board and president of Willys-Overland Motors, Inc., recently stated that the new Willys-Overland passenger car line will include a five-passenger, two-door sedan and a five-passenger, two-door convertible sedan. Each will be powered by the new Willys-Overland six-cylinder engine, which under exhaustive tests, is said to reveal an economy closely approximating that of the Willys-Overland four-cylinder engine. A Jeep station wagon with an all steel body also will be added to the Willys-Overland line. The station wagon, as well as the sedans, will be equipped with a new form of wheel suspension.

Bliss Moves to Detroit

As one phase of a \$2 million expansion program, E. W. Bliss Co., one of the country's largest manufacturers of stamping presses, rolling mills, and can-making machinery, has moved its executive offices to Detroit from Brooklyn, N. Y., according to D. S. Harder, president. The move is being made, he said, because a large part of the company's business stems from centrally controlled industries, such as automotive.

Advertising Notes

Sheldon M. Fisher, for a number of years connected with the sales promotion and advertising department of U. S. Tires, in various capacities, has joined the New York staff of Campbell-Ewald Co., Inc., advertising agency.

Electrol, Inc., of Kingston, New York, manufacturer of aircraft hydraulic systems, has appointed Charles H. Gale Associates, Inc., New York City, as public relations counsel.

Design of Rubber Torsion Springs

(Continued from page 27)

of the most suitable compounds is generally from 40 to 60 durometer but the type of service usually determines the best compound. It is a safe assumption that most calculations should be made for 45 durometer if natural rubber, and 50 durometer if synthetic rubber is to be used.

For calculating, it is convenient to measure the thickness of the rubber wall as a per cent of the diameter of the inner member. For instance, if the inner member is a shaft or tube having one in. outer diameter and the rubber wall has one quarter in. radial thickness, the wall will be 25 per cent of the shaft diameter. It is fundamental that all springs having the same per cent wall, if rotated through the same angle will develop the same shearing stress on the bond between the rubber and the shaft. If one spring has a two in. shaft and a half in. radial thickness of rubber, giving a 25 per cent wall, and another spring has a four in. shaft and a one in. radial thickness of rubber, they each will have the same shearing stress on the bond to the shaft if they are rotated through the same angle.

The graph of spring characteristics (Fig. 8) shows the relation between wind-up and static stress for rubber wall thickness, varying from 10 per cent to 50 per cent of the shaft diameter. The graph is made for 42 durometer stock. If 50 durometer is to be used, multiply the stress for a given angle by 1.37 and by 1.62 for 55 durometer. For dynamic conditions, that is where the spring is flexed through a full cycle in two or three seconds or less, the spring will have a stiffer rate than the curves show in Fig. 8. The ratio between static and dynamic rate will depend on the compound used. For natural rubber of 45 durometer hardness, the ratio may be assumed to be 1.25 or the dynamic rate is 125 per cent of the static rate. For synthetic rubber at 50 durometer, the ratio may be assumed at 1.50.

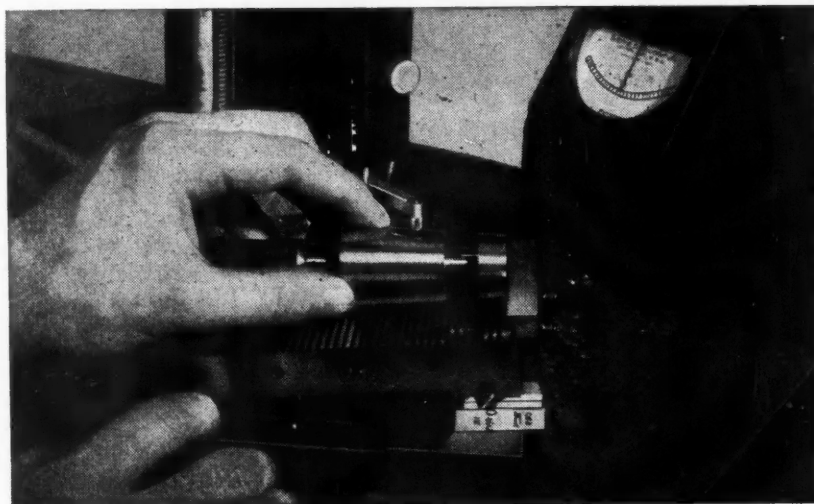
There is one other characteristic of these rubber springs which is not easily shown in graph form. That is the life of the unit. In attempting to forecast actual service life of a rubber spring by means of accelerated fatigue tests, it is necessary first to emphasize the extremely wide difference between steel and rubber as elastic materials. Any acceleration in the normal flow of energy through a spring may reasonably be expected to have an exaggerated effect on the rubber as compared with steel. This is substantiated by all available test data. Accelerated laboratory tests as well as road tests have been used in establishing basic design limitations which will give spring life equivalent to maximum car life without wasting material. The Torsilastic spring shown in Fig. 1 and used for illustrating spring character-

istics in the other figures is designed in accordance with these limitations, although a wide range of springs can be designed for any given capacity.

Maximum permissible shear stress on the bond between the rubber and the shaft depends on many factors, such as frequency at which the maximum occurs and stress range. For unusual or infrequent stresses, which occur seldom in the life of the spring, we have successfully used extreme stresses as high as 300 psi. For most

application the maximum should be lower than this.

The range through which the stress on the rubber varies will determine to some extent the life expectancy of the spring. If the spring is flexed continually from free condition to 300 psi, the life would be relatively short. If the range is from 120 to 130 psi the life would be longer than from zero to 100 psi. Reversing the direction of stress, as from plus 50 psi to minus 50 psi, will give shorter life than where



a ten-thousandth is routine . . . where JO-BLOCKS control by millionths!

It PAYS to control parts-dimensions to close limits. It pays in ease of assembly, in product performance and in the assured fit of replacement parts. In wartime, it paid richly in human lives saved. JO-BLOCKS, the pioneer precision controls, produced in America by Ford Motor Company only, for all industry, are warranted accurate to .000002", .000004" or .000008" \pm , and are available in sets at \$23 and upward, or in individual blocks, with various accessories. With properly selected genuine Jo-Block equipment, accuracy control can be maintained to the highest practical degree over any mechanical dimensional inspection.

FREE—NEW CATALOG!

Profusely illustrated, with full details, covering selection, use and care of Jo-Blocks. Write Ford Motor Co., Johansson Div., Dept. 43, Dearborn, Michigan.



the stress is always in the same direction.

In any of the designs thus far considered there is very little exposed surface of rubber and any deterioration at these exposed ends has been found to have a negligible effect on spring life. It has not been found necessary to use a shield of any kind at the ends, and the aging of the body of rubber is extremely slow and requires longer than the total life of the car to make any appreciable change.

In general, best results can be obtained where there is relatively little eccentric loading; that is, where the torque arm applies the load near the

center of the spring length, although this is not always possible. If the spring is relatively long as, for instance, five or more times the shaft diameter, it will resist eccentric loading or tilting much better than a short spring. A spring with relatively thin walls of rubber, that is, less than 20 per cent of the shaft diameter, will resist tilting better than a thick walled spring.

The Torsilastic type spring performs its own locating functions; that is, it resists axial movement and tilt. The slight flexibility in these directions is a distinct advantage in most installations as it absorbs impacts in every di-

rection. This also makes unnecessary the added cost and weight of bearings and bearing seals and eliminates squeaks and rattles and maintenance operations such as lubrication.

Production and Price Control

(Continued from page 15)

Even though a statistical showing of comparatively high peacetime production levels can be made, we know that we are not obtaining the goods the public wants most. Thus our production is out of balance with the desires of consumers. In a freely-functioning market price changes quickly would correct such maladjustments. Price controls multiply the maladjustments until the entire production system breaks down.

When price control holds the price of a commodity below its free market level, two things inevitably happen: demand is encouraged and supply is discouraged. Thus the shortage of that commodity grows, rationing becomes necessary and the consumer pays the bill. Next in order will be material priorities and all other wartime controls under which industry would be told not only at what price it can sell its goods, but what type of goods it can make. What is more, consumers will be told what they can have, irrespective of what they want. A system of wage stabilization would have to be adopted and, ultimately, workers would be told where they must work.

The result would be, as Henry Hazlitt, the brilliant *New York Times* writer, has so well said: "A completely petrified totalitarian economy, with every business firm and every worker at the mercy of the Government and with a final abandonment of all the traditional liberties that we have known.—*Extracts from a presentation before the House Banking and Currency Committee.*"

Five Year Plan Ineffective

(Continued from page 17)

There are two plans for the improvement of the factory equipment, one being based on 10 years and the other on five years. Under the ten-year plan 23,500 machine tools will be bought and 28,000 will be rebuilt. Thus, at the end of this period 33,000 machines will have an average age of 20 years, 23,500 will have an age of five years and 28,000 will be 18 years old on an average. The scheme will cost seven billion francs on 1938 value.

Herrington Appointed

Appointment of Arthur W. Herrington, of Indianapolis, Ind., as chairman of the A.A.A. Contest Board, succeeding Captain Eddie Rickenbacker who had held that post since 1927, was announced by H. J. Brunnier, president of the American Automobile Association.



Product planners with springs on their minds will find it helpful to talk things over with Accurate Engineers. For we're planning better products too—better springs, better engineering and better service. These are really more than plans—they have been tested and proved in Accurate's all-out production of fighting springs. Accurate men and machines and methods are ready now to produce the precision springs you'll want for your better products . . . whenever you are ready.



**SPRINGS
WIREFORMS
STAMPINGS**

Send for your copy of the new Accurate Spring Handbook. It's full of data and formulae you will find useful. No obligation, of course.



ACCURATE SPRING MANUFACTURING CO.
3811 W. LAKE STREET CHICAGO 24, ILLINOIS



Michigan WELDED STEEL TUBING

ALSO
SQUARE • RECTANGULAR
Minimum dimension $\frac{1}{2}$ "
Maximum dimension $2\frac{3}{4}$ "
14 to 20 gauge.

ROUND $\frac{1}{4}$ " to 4" O.D.
9 to 22 gauge

**IN SIZES AND SHAPES WITHIN THE ABOVE RANGE
FOR YOUR PARTICULAR FABRICATING NEEDS!**

25 years in the business has acquainted us thoroughly with the needs of manufacturers of parts made from welded steel tubing.

Not only is Michigan tubing

available in the most frequently specified size range but its structure and manufacture is closely guarded for satisfactory and economical reforming and machining into parts.

PARTS PREFABRICATED

Michigan is completely equipped to fabricate your parts for you. Michigan welded steel tubing

can be forged, flanged, expanded, bent, spun, tapered, beaded, machined, etc.

*Engineering advice and technical help in the selection
of tubing best suited to your needs.*

Michigan **STEEL TUBE PRODUCTS CO.**

More Than 25 Years in the Business

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ARE YOU MISSING A CHANCE TO IMPROVE YOUR PRODUCTS BY REVISING INEFFICIENT PROCEDURES?



If your plant handles metal, read how this one

**Solved a wasteful rust problem
Saved money
Speeded production
Served its customers better —**

THE PROBLEM

A large Eastern firm handled commercial heat-treating of precision-machined parts by

- heating in a salt bath to required temperature;
- quenching heated parts in bath of plain water;
- drying water off by running through a long oven;
- dropping into tote-boxes to be shipped back to customer.

By the time the parts came out of the drying oven, they had begun to show signs of rusting. This rusting progressed very rapidly thereafter. Extensive spoilage resulted, and customers were dissatisfied.

This illustrates but one use for one of Nox-Rust's complete line of rust preventives and removers, protective coatings, and specialized industrial chemicals. You should not be without the new Nox-Rust catalog describing other products that might help your firm. A copy will be mailed upon request.

THE SOLUTION

A Nox-Rust field engineer was called in, and following his recommendations, this procedure was adopted:

- heat in salt bath,
- quench in plain water,
- dip in Nox-Rust 310-AC,
- deliver.

Since the change, there has been no sign of rusting, the drying oven has been eliminated, and operation time reduced. Nox-Rust 310-AC displaces the water, removes fingerprints, renders acid vapor residues inert, rust proofs the parts for transit and storage. And customers appreciate being given this "extra" in service!

Chemicals for American Industry
NOX-RUST
CHEMICAL CORPORATION

2433 So. Halsted St., Chicago 8, Ill.



Increases in New Car Prices Announced by OPA

Increases in factory ceiling prices for 1946 model passenger automobiles manufactured by Ford, Hudson, Chrysler and Nash have been announced by the Office of Price Administration. The following official prices, F.O.B. factory, do not include excise taxes, transportation, or preparation and handling charges.

FORD	New	Old
De Luxe eight		
3 passenger coupe	\$846	\$834
Tudor sedan	895	882
Fordor sedan	945	931
Super De Luxe eight		
3 passenger coupe	904	891
Tudor sedan	954	940
Fordor sedan	1004	989
Sedan coupe	991	977
De Luxe eight		
Chassis with open or closed end	687	676
Super De Luxe eight		
Convertible coupe	1139	1124
Station wagon	1186	1170
Chassis with open or closed front end	754	744

LINCOLN	New	Old
Sedan, 4 door, model 73	1825	1799*
Club coupe, model 77	1810	1784*
Sedan, 4 door, model 73, with custom interior	1943	1915*
Club coupe, model 77, with custom interior	1928	1900*
Convertible coupe	2261	2229
Continental coupe	3445	3394
Continental cabriolet	3511	3459

MERCURY	New	Old
Sedan, 2 door	1129	1114
Town sedan, 4 door	1177	1162
Sedan coupe	1166	1151
Club convertible	1338	1320
Chassis with open or closed front end	846	835
Station wagon	1350	1332

HUDSON	New	Old
No. 51 Series Super Six		
Chassis	843	831
3 passenger coupe	1101	1085
Brougham (2 door)	1127	1111
Sedan (4 door)	1164	1147
Club coupe (6 passenger)	1162	1145
Convertible brougham	1446	1426
Commodore Six		
3 passenger coupe	1208	1191
Sedan (4 door)	1280	1263
Club coupe	1282	1264
Brougham (2 door)	1247	1230
No. 53 Series Super Eight		
Chassis	932	919
Club coupe	1286	1268
Sedan	1289	1270
No. 54 Series Commodore Eight		
Sedan	1353	1334
Club coupe	1341	1323
Convertible brougham	1587	1565

PLYMOUTH DE LUXE	New	Old
4 door sedan	999	998
2 door sedan	949	947
3 passenger coupe	912	910
Club coupe	990	988

PLYMOUTH SPECIAL DE LUXE	New	Old
4 door sedan	1027	1025
2 door sedan	987	985
3 passenger coupe	952	951
Club coupe	1029	1028

DODGE DE LUXE	New	Old
4 door sedan	1087	1086
2 door sedan	1044	1043
3 passenger coupe	981	980

DODGE CUSTOM	New	Old
4 door sedan	1147	1145
Club coupe	1137	1136

*1942 model prices for Lincoln-Zephyr. Lincoln-Zephyr called Lincoln in new 1946 line.

(Turn to page 86, please)



The difference between RIGHT and WRONG . . . he says

LOOK, OZAKI . . . Here is the difference between RIGHT and WRONG in manufacturing a bracket such as shown:

WRONG:

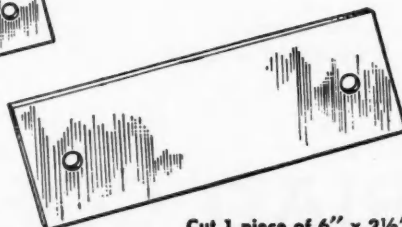


Cost 13¢ each
of conventional construction.

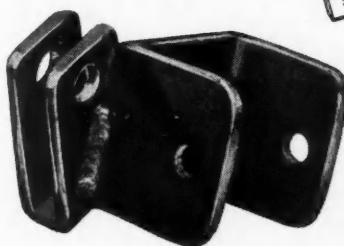
RIGHT:



Cut 1 piece of 6" x 1½"
x ¼" strap. Drill holes
in ends. Bend in U.



Cut 1 piece of 6" x 2½"
x ¼" strap. Drill holes
in ends. Bend in U.



Fit up in jig and weld on
both sides.

Cost 8¢ each
of welded steel.

DIFFERENCE: Saved 5¢ Each

This bracket, 10 of which are used on each harrow, is typical of many parts changed over to welded design by an implement manufacturer. Perhaps your product has similar parts. The Lincoln Engineer will gladly help you study the possibilities of welded design as applied to your problems.

STUDIES IN MACHINE DESIGN . . . issued periodically. Free on request. Ask for them on your business letterhead.

THE LINCOLN ELECTRIC COMPANY
DEPT. 392 CLEVELAND 1, OHIO

The RIGHT Ways to Control Distortion
The new Lincoln sound-color movie, "The Prevention and Control of Distortion in Arc Welding", by Walt Disney Productions, explains simply and clearly the causes and cures of distortion. A valuable aid to designers and production men. Available free for showing to groups. Ask for Bul. 709.

America's greatest natural **recourse**
ARC WELDING

New Products

(Continued from page 46)

mersion of a graphite rod anchored in the bath. This salt provides long electrode and pot life and possesses increased fluidity with less drag-out and less make-up required.

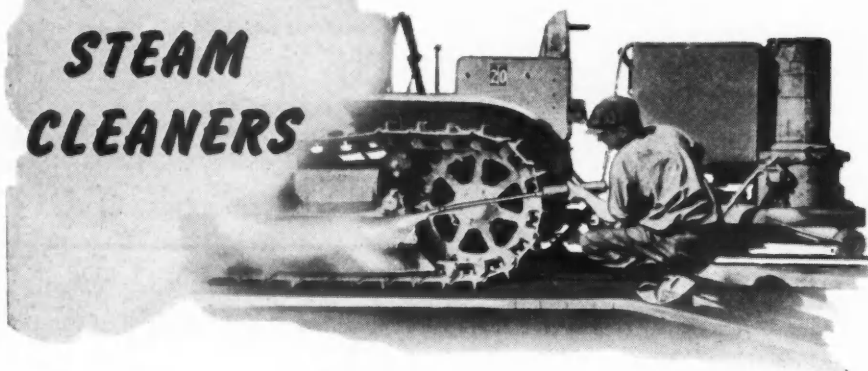
Antisep soluble oil is a new concept in soluble oils featuring cleansing ability and antiseptic properties. Even at dilutions as high as 1 to 160 the solution will not cause or permit rust. It is non-gumming, non-sludging and has no tendency to turn rancid.

Houghton's Mar-Temp oil is advocated by the maker for hot quenching between the normal quenching oil range and 400 F., thus entering the lower range of the regular martempering zone and aiding materially in prevention of distortion or quench cracks.

VIX-SYN packings of homogeneous and fabricated types have been added to the VIM leather packings to make up a complete line for all purposes up to 700 F.

TRIAD COMPOUNDS

For
**STEAM
CLEANERS**



Triad steam cleaner compounds eliminate "limed-up" clogged coils and nozzles which impair the efficiency of steam cleaning equipment of the flash boiler type. Expensive cleaning compounds are not essential.

Water control, so necessary in hard water localities, is built into Triad compounds. Additional water softeners are unnecessary.

Two different Triad cleaners—both 100% water-soluble—are recommended for use with all types of steam cleaning equipment. Triad 66 is for heavy-duty cleaning and paint stripping, while Triad B is specified for light or medium cleaning and for use with non-ferrous metals.

GUARANTEED PERFORMANCE—all Triad cleaners are shipped on a guaranteed performance basis for thorough tests.



Angular Contact Ball Bearings

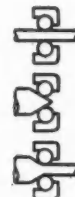
Miniature Precision Bearings of Keene, N. H., is now manufacturing miniature, angular contact ball bearings which are offered in four sizes. No separator is required since the balls are fully self-retained and likewise no cap is necessary. The bearings may be used to take radial or thrust loads or



ACTUAL
SIZES



CROSS
SECTION



VARIOUS
SHAFTS USED

Miniature bearing showing application

a combination of both. They are said to function safely and effectively under unusually heavy loads and high speeds for their weight and size, yet respond efficiently in light service. Present applications of the bearings are for electric motors, scale mechanisms and accelerometers. The bearings are made of chrome alloy bearing steel to precision tolerances and are available for immediate delivery.

Cimcool Introduces Four New Products

The Cimcool Division of the Cincinnati Milling Machine Co., Cincinnati 9, Ohio, is introducing four new products which may be described as follows:

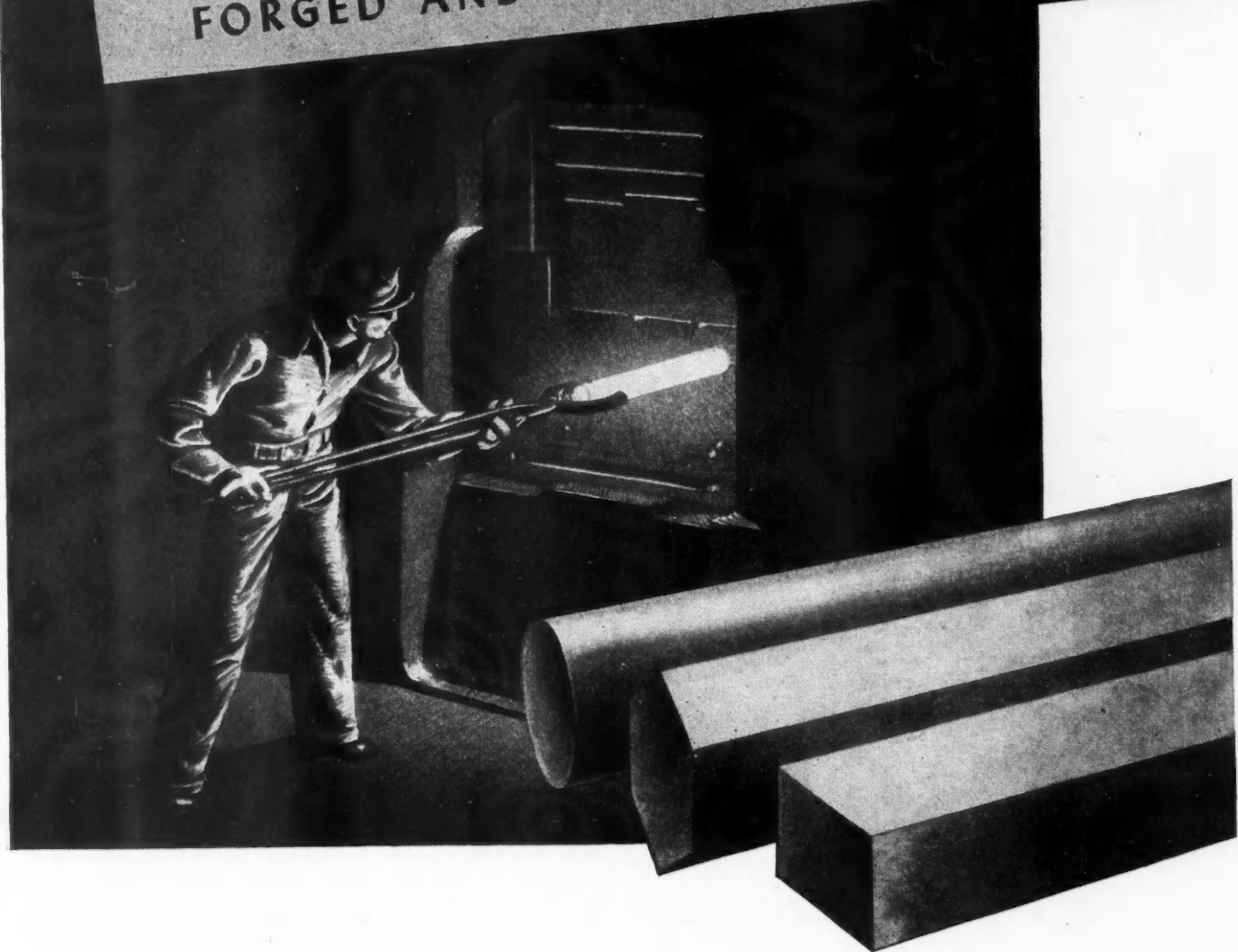
Cimcool Optogrand, which is a specialty grinding fluid for use with diamond wheels or very fine vitrified wheels for grinding glass and carbide. This material has a high detergent action and is said to produce a higher finish and better wheel life than the conventional grinding fluid used for these purposes. This material also has high heat absorbing qualities which will eliminate burns and checks on carbide tools and will permit the grinding of optical lenses without heat cracks.

Cimcool tapping compound, an extreme pressure tap lubricant, is a chemical emulsion in water and not a highly compounded oil as is generally used for tapping. This tapping compound is soluble in water emulsion cutting fluids and hence, on a combination drilling and tapping operation where the operator dips taps at regular intervals, the surplus fluid dropping into the reservoir will go into solution and will not form a heavy oily film on top of the machine reservoir. Furthermore, this tapping compound will not smoke and has no fire hazard.

(Turn to page 78, please)

JALLOY

THE HARD, TOUGH STEEL FOR
FORGED AND HEAT TREATED PARTS



JALLOY is a special steel particularly applicable for machine parts that are subjected to dynamic stresses, sudden shocks or abrasive action. It can be forged and heat treated to obtain the desired physical properties. Write for further information.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PENNSYLVANIA



April 15, 1946

When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES

77

Cimcool center saver is an extreme pressure water repellent lubricant for use on lathes and grinder centers. This material is not soluble in the regular water emulsion types of grinding and cutting fluids and has extreme resistance to temperature and pressure.

Cimcool waterproof grease is an extreme pressure water repellent lubricant for use on adjusting screws, gears, clutches, chuck jaws, grinding wheel collets, screws, etc., where the conventional water emulsion type of cutting fluid tends to wash away the ordinary lubricating oils and greases.

Iridite Process Adds Corrosion Resistance

Iridite Bright, a chemical treatment that produces a mirror-bright, transparent, chromate film on zinc or cadmium plated parts, has been added to the line of Iridite finishes manufactured by Rheem Research Products, Inc., Baltimore, Md.

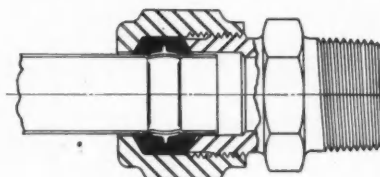
Iridite Bright is said to form an entirely new, corrosion resistant finish on the surface of the metal. The Iridite Bright coating greatly reduces finger-marking and will not fade or tarnish.

No electric current is used by the

process. Parts being treated are immersed in the Iridite Bright solution for 5 seconds, followed by the usual rinsing and drying. A low-concentration caustic rinse is sometimes used following the rinse after Iridite Bright to yield an even more brilliant finish.

Pressure Fitting to Absorb Shock

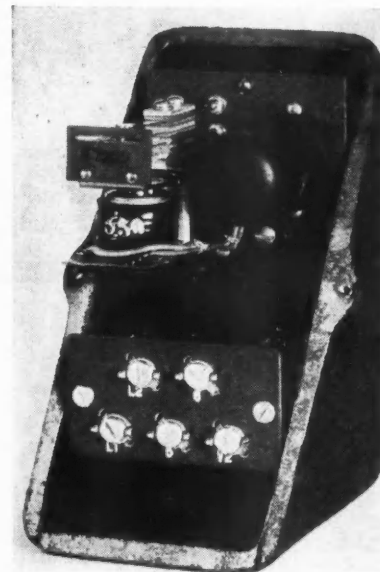
A shock absorbing and vibration fatigue proof pressure fitting is being offered by the Chicago Forging & Manufacturing Co., Division of The Palmer Corp., 2000 Southport Ave., Chicago 14, Ill. Named Sealastic, the



Sealastic Coupling

connection is for application on all types of metal tubing—steel, brass, copper, aluminum or magnesium. There (Turn to page 80, please)

Electronic Relay for Precision Gaging



This super-sensitive relay, a product of Automatic Temperature Control Co., Inc., 34 E. Logan St., Philadelphia 44, Pa., is actuated by dimensional changes down to micro-inches from "feelers" carrying as little as 2 micro-amp. current, and can serve as a device for precision gauging of mass produced parts. Snap acting SPDT control contacts carry 12 amp at 110 volts, alternating current, and can be used for starting or stopping a machine motor or giving an alarm when dimensional tolerances are exceeded. Unit is shown mounted in one half of a dust-tight and weather-proof metal enclosure.

Drop Forgings

any size or shape up to 200 lbs.



by Herbrand

If you require quality drop forgings, in quantities of thousands or millions... Herbrand is an excellent source of supply.

YOUR INQUIRIES ARE SOLICITED

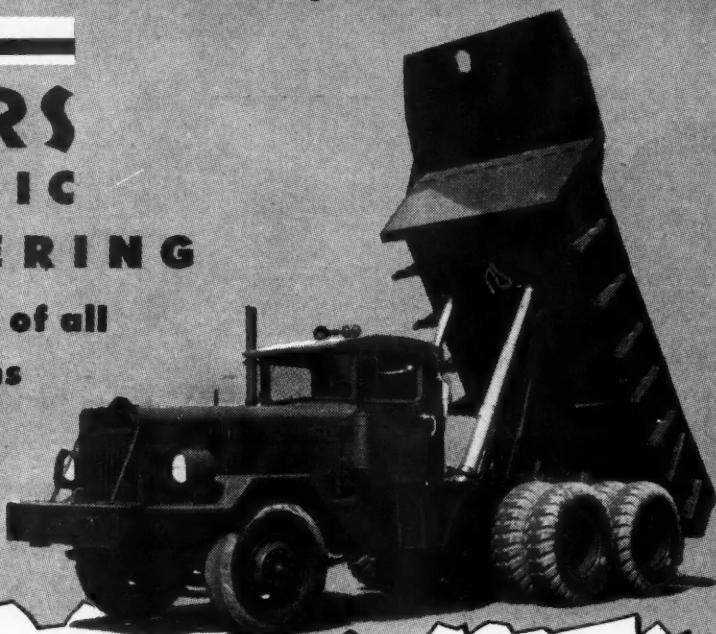
THE HERBRAND CORPORATION • Fremont, Ohio

Drop-Forged Tools Since 1881

STERLING MOTOR TRUCK CO., INC. REPORTS:

VICKERS **HYDRAULIC** **POWER STEERING**

**Relieves the Driver of all
Steering Strains**



The chassis illustrated is one which has been developed for off-the-road operations and built to carry 30 ton payloads. Chassis of this type are called upon to operate over rough terrain under adverse conditions, demanding the most efficient steering mechanism available. For that reason, we equipped this chassis with the Vickers Power Hydraulic Steering Booster, which relieves the driver of all steering strains and makes it possible for him to work long hours without exerting undue effort.

This excerpt from a letter by the Sterling Motor Truck Co. mentions the advantages of Vickers Hydraulic Power Steering to the driver but it does not indicate how easily and conveniently this equipment can be applied to most existing chassis designs. The separate and compact power cylinder (booster) is connected to the drag link at one end and the chassis frame at the other; it is controlled by the pitman arm. The existing steering gear is not altered.

There are many other advantages of Vickers Hydraulic Power Steering. Write for Bulletin 44-30 which gives all the facts.

VICKERS Incorporated

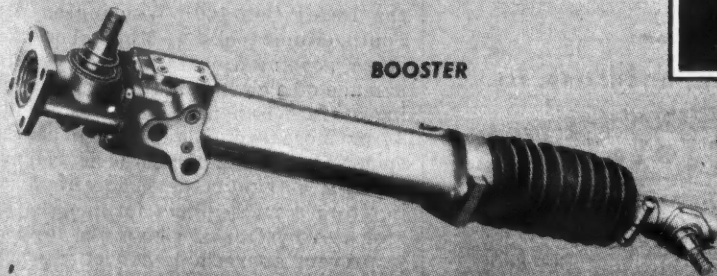
1428 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CINCINNATI • CLEVELAND
DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA • ROCHESTER
ROCKFORD • TULSA • WORCESTER

VICKERS HYDRAULIC POWER STEERING

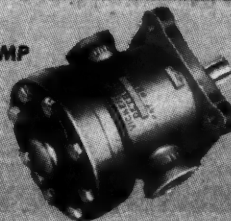
Is Simple . . . Compact . . . Easily Installed

1890



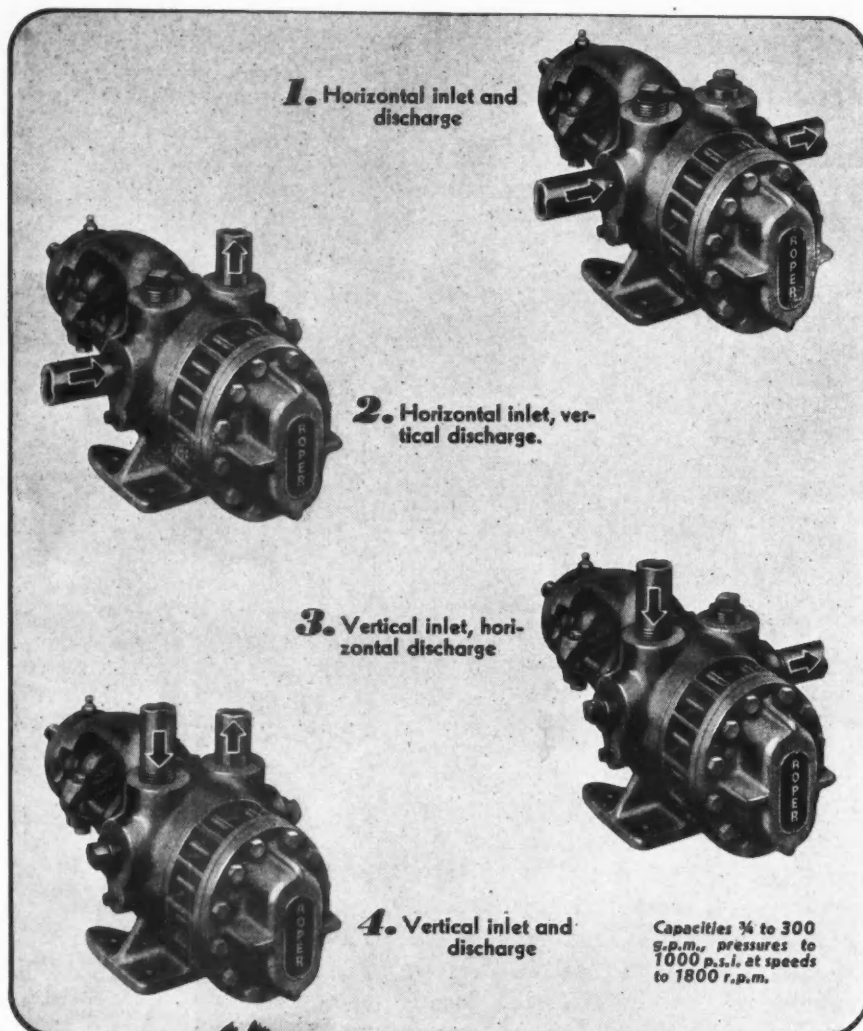
BOOSTER

PUMP



**RELIEF
VALVE**





4 PORT DESIGN CUTS INSTALLATION TIME

A Roper Feature Your Customers Appreciate

Eight optional piping connections are possible with the Roper 4-port design. Four piping arrangements are illustrated with the pump operating clockwise... four other arrangements are possible with the pump operating counter clockwise. One of many time-saving advantages in Roper design.

Other Features That Help You Sell

Hydraulic self-lubricating principle, oversize bearings, packed box or mechanical seal, efficient operation in either direction, floating equal size gears, axial hydraulic balance, accessibility of working parts without removing piping or mounting, interchangeable parts. Sizes $\frac{3}{4}$ to 300 g.p.m., pressures up to 1000 p.s.i. speeds up to 1800 r.p.m.

Send for Catalog and Jobbing Proposition

GEO. D. ROPER CORP., 604 BLACKHAWK PARK AVE., ROCKFORD, ILL.

PUMPS ESPECIALLY ENGINEERED TO FIT YOUR REQUIREMENTS



BUILDERS OF PUMPS FOR MANUFACTURING, MARINE, PETROLEUM, AND PROCESS INDUSTRIES



are no metal to metal joints and repeated connections and disconnections can be made with no loss of strength or positive sealing qualities, the company claims. The fitting lends itself to rapid assembly on the production line, as it absorbs longitudinal stresses and compensates for inaccurate tube cutting or slight angular misalignments. It is said to withstand extreme pressure or temperature and may be used effectively on trucks, railroad equipment, refrigeration systems or airplanes.

Dial Indicator Gage for Extremely Small Holes

A dial indicator gage for extremely small holes has been put on the market by Federal Products Corp., Providence, R. I. This new gage will gage holes as small as .122 in. and up to .250 in. ID., and it will also gage these small holes up to depths as great as $2\frac{1}{4}$ in. Variations within the range .122 in. up to .250 in. are obtained by the use of a set of twelve interchangeable gaging plugs.

The gage is calibrated and set for any specified ID to reveal the condition of holes up to a total range of plus or minus .004 in. The minimum graduation



Federal dial indicator gage

tion is .0001 in. The dial is balanced and can be rotated (0-4-0). The sensitive contact of Model 1203 P-1 is a hardened steel ball, and the reference contact is a chrome plated plug body. The gage is furnished with extra balls of the specified size to fit the gaging plug.

New Surface Plate

A new and improved type of surface plate is being offered to the trade by the DoAll Co., 1301 Washington Ave. South, Minneapolis 4, Minn. The plate has a working area 14 in. by 24 in., and is made of a close grain iron. The working surface is hand scraped to produce 22 or more evenly distributed bearing spots per sq in., which it is claimed, gives a maximum deviation of 0.0002 in. from a mean plane for the bearing areas. A system of ribbing is designed to prevent appreciable deflection of the
(Turn to page 82, please)



this flexible metal hose
resists . . .

HIGH TEMPERATURE
REPEATED FLEXING
HIGH PRESSURE
CORROSION
VIBRATION

The flexibility of rubber . . . plus the all-'round stamina of Monel, Nickel and Inconel . . . is yours when you use flexible metal hose made by Eclipse.

The hose carries steam, corrosive fluids and gases. In some of the smaller diameters, test pressures up to 3000 p.s.i. have been applied with safety. And, with Inconel flexible hose now being successfully produced experimentally, the temperature ceiling has been raised to 2000° F.

The tubing is absolutely leakproof, for it is really a seamless metal tube that has been compressed into a series of bellows-like corrugations.

With corrugations deep, parallel, and rounded at top and bottom, the tubing is highly flexible.

Diameters as small as 1/8" are available.

If you've been bothered by rubber or soft metal tubing that can't "take" it, investigate all-Monel, all-Nickel or all-Inconel flexible tubing. For more information, write the manufacturer: Metal Hose Dept., Eclipse-Pioneer Division, Bendix Aviation Corp., Teterboro, N. J.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N.Y.

NICKEL  ALLOYS

MONEL* • "K" MONEL* • "R" MONEL* • "KR" MONEL* • "S" MONEL* • INCONEL* • NICKEL • "L" NICKEL* • "Z" NICKEL*
*Reg. U.S. Pat. Off.

April 15, 1946

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surface, and three feet are so placed as to insure a minimum of sagging.

The underside of the $\frac{3}{4}$ -in. overhang is machined all around so that work or fixtures can be clamped to the surface plate. The edge of the working surface has also been drilled and tapped on two-in. centers. The plate comes with removable handles and a plywood cover.

Tool Makers Set of Master Gage Blocks

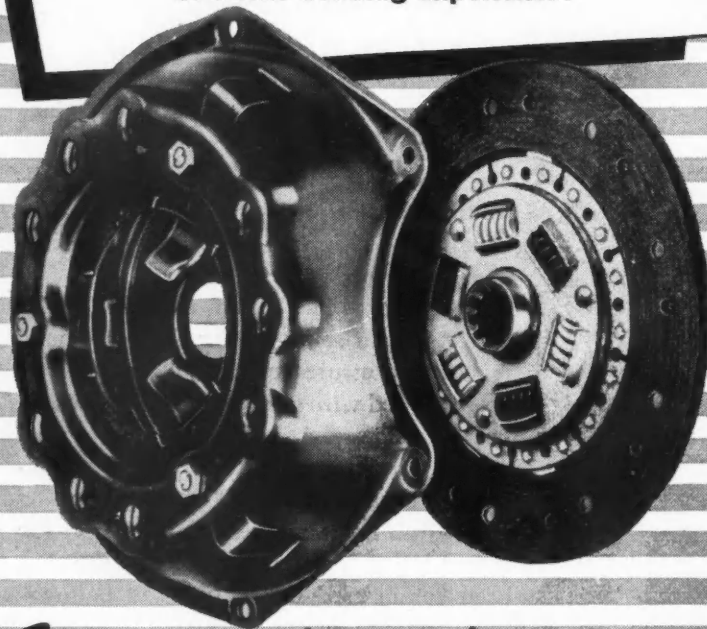
A new "Tool Makers" set of five Ellstrom Master gage blocks, accurate to plus or minus eight millionths of an



"Tool makers" set of Ellstrom master gage blocks

inch, is being offered by the Dearborn Gage Co., 22038 Beech Street, Dearborn, Mich. This new combination is especially assembled for individual ownership by tool makers and machinists. Available in .0625, .125, .250, .500 and 1 in., this smaller precision gage set will make 31 combinations in 1/16-in. steps up to 1-15/16 in. All gaging surfaces are chromium plated and each set is contained in a walnut case.

Engineered by Borg & Beck
means . . . backed by forty-one years
of clutch-building experience!



You can depend on—
BORG & BECK

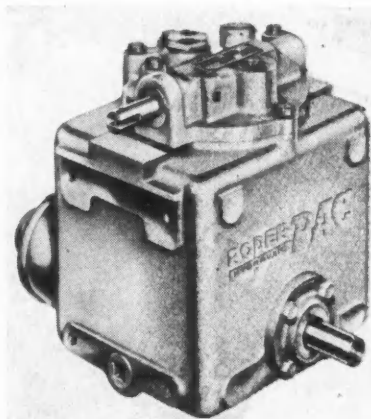
For that vital spot where Power takes hold of the load!

BORG & BECK DIVISION
BORG-WARNER CORPORATION
CHICAGO, ILLINOIS



Hydraulic Power Unit For Tractors

A compact, self-contained hydraulic power package especially designed for universal application on farm tractors has been introduced by Geo. D. Roper Corp., Rockford, Ill. Engineered for a wide range of operating speeds, it is said to be easy to apply and use on all



Roper-PAC power package

makes and sizes of tractors. The "Roper-PAC" contains three fundamental elements: a rotary gear pump, control valves, and an oil reservoir. Unloading features prevent damaging heat build-up and overloading.

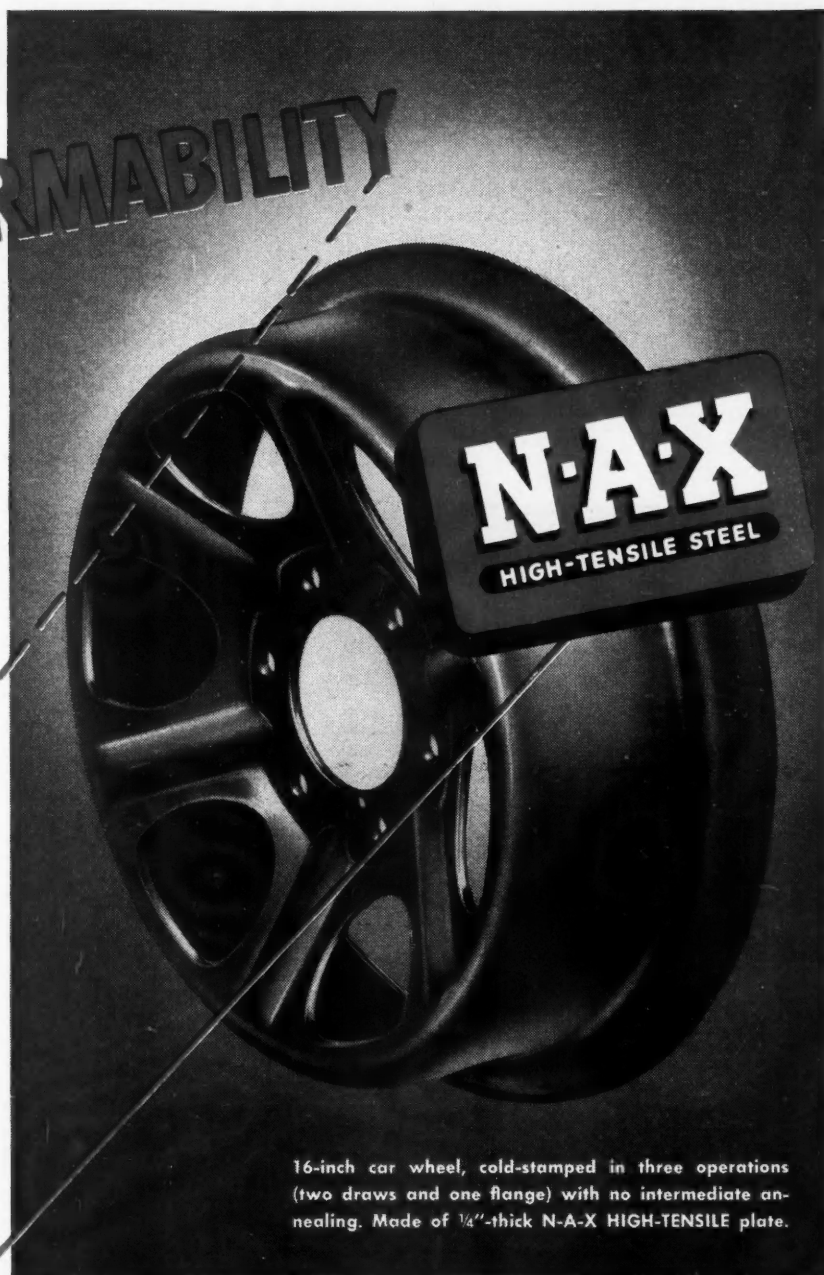
When controls are once set in the raise position, the "Roper-PAC" retains itself in this operating cycle, unless manually changed or overloaded, until the maximum stroke is reached. A valve then automatically unloads the pump, allowing the oil to recirculate at low pressure in the sump. A check valve holds the load securely in position. There is no slipping back. Operator can raise, jog, stop, or lower the load to suit conditions of work. The lowering stroke is rapid, but can be retarded. When needed, extra power is obtainable for a short duration by holding in reset position. As a safety feature, the operating control always retains itself in a non-operating cycle until manually actuated.

(Turn to page 84, please)

EASY FORMABILITY

**N-A-X/ HIGH-TENSILE STEEL
HAS ALL SIX — KEEPS ALL SIX**

- HIGH STRENGTH
- EXCELLENT WELDABILITY
- HIGH FATIGUE-RESISTANCE
- GREAT IMPACT TOUGHNESS
- HIGH CORROSION-RESISTANCE



16-inch car wheel, cold-stamped in three operations (two draws and one flange) with no intermediate annealing. Made of 1/4"-thick N-A-X HIGH-TENSILE plate.

**GREAT STEEL
FROM
GREAT LAKES**

... WITHOUT LOSS OF OTHER CHARACTERISTICS

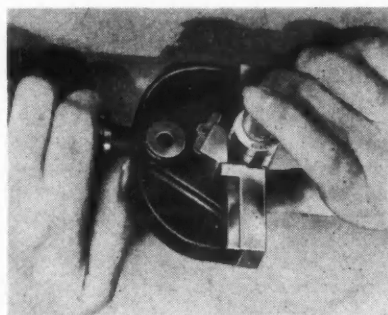
Because of an unusual combination of physical properties that are inherent in the steel, N-A-X HIGH-TENSILE will take deep and difficult cold forms *without losing other desirable characteristics*. It retains structural strength, impact toughness, fatigue-resistance, excellent weldability and high corrosion-resistance during and after production processes. It makes possible lighter, stronger, more durable parts and products, and greater economy in manufacturing. For better steel stampings, specify N-A-X HIGH-TENSILE steel.

GREAT LAKES STEEL CORPORATION

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

New Fixture Uses Air to Check External Dimensions

New standard adjustable Airsnap fixtures for use with Precisionaire instruments have been announced by the Sheffield Corp., 721 Springfield St., Dayton, Ohio. These adjustable Airsnaps provide desirable flexibility in checking external dimensions by air in or at the machine or at the bench, and are available in eight models covering a range of from 0.250 in. to 2.000 in. inclusive. Larger sizes may also be had on special order. The maximum diameter of the part to be checked determines the size range and model. Standard adjustable



Checking outside diameter by means of the new adjustable standard Airsnap



NOPAK Manifold Valves are made in 3- and 4-way styles for single and double acting cylinders.



NOPAK Manifold Valves Promote Efficient Operation . . .

Where a number of air cylinders are to be controlled from a single station, NOPAK Manifold Valves permit highly efficient and compact assembly without complicated, unsightly piping. The operator's efficiency is increased, because all valves are mounted within easy reach on a single manifold, with levers aligned in vertical position.

NOPAK Manifold Valves embody the famous NOPAK Cored Disc design, packless construction, easy, positive control, and leakproof, wearproof qualities. Bases are milled flat to provide a flush surface for gaskets if valves are bolted to a manifold plate. Individual pipe nipples may also be screwed into the valve body if the cored holes in the base are tapped out.

GALLAND-HENNING MFG. CO., 2774 S. 31st St., Milwaukee 7, Wis.

NOPAK

VALVES AND CYLINDERS

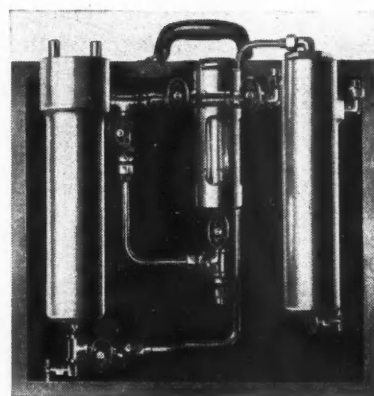
DESIGNED for AIR and HYDRAULIC SERVICE

A 4976-1/2I-A

Airsnaps can be used with Sheffield Precisionaires on dimensions with tolerances ranging downward from 0.002 in. Special adjustable Airsnaps may be used for checking to tolerances of 0.0002 in. down to ten-millionths or less.

Dehydrator Unit for Compressed Air Lines

The D-10 dehydrator unit, produced for the armed forces during the war by Russel R. Gannon Co., Gwynne Bldg., Cincinnati, Ohio, is applicable to many commercial dehydrating problems as it is capable of dehydrating compressed air lines with pressure up to 2000 psi. Furthermore it eliminates cumbersome installations in most instances and the dehydrating chemicals are said to be so



D-10 dehydrator unit

inexpensive to replace as to be expendable at a negligible cost. The unit can be equipped with a precision-tested dew point color change indicator which insures accuracy of working conditions.

Hydraulic Drive for Cars Studied by Manufacturers

According to the evidence around Detroit it appears that a number of manufacturers are studying the possibility of hydraulic power drive for motor cars. Some time ago, it was freely admitted that the experimental Russell car was designed for hydraulic power and was being tested by one of the motor car manufacturers. Since then unconfirmed rumor has it that one of the experimental Tucker cars has been fitted with hydraulic power and currently is undergoing road testing. We also have learned that the producer of an unusual type of hydraulic generator expects very soon to start work on the development of a hydraulic system, using a high performance generator in conjunction with high output hydraulic motors at the wheels. The significant thing is that several passenger car and truck builders are said to have an interest in this development.



43
YEARS

The history of Long radiator manufacture goes back to the very beginning of the automotive industry, and we have been at it ever since. The experience and knowledge gained in this lifetime of specialization are incorporated in every Long radiator produced today. Long Mfg. Division, Borg-Warner Corp., Detroit and Windsor, Ont.

LONG

CLUTCHES • RADIATORS • OIL COOLERS

Frazer Production May Start in Few Weeks

Production of Frazer cars is scheduled to start late in April, according to Joseph W. Frazer, president of Kaiser-Frazer Corp. He said it is expected that about 100 cars can be built in the closing days of the month and that the schedule for May is 500, for June 2500, and July, 8000. The company hopes to build 90,000 cars during the last quarter and about 147,000 for the year. The Kaiser will go into production about mid-summer, according to present plans.

Although original plans called for complete body manufacturing facilities at Willow Run, inability to obtain presses and other equipment has forced a change. At the outset, stampings will be purchased from outside vendors and the body assembled at the factory. Delivery of stampings has been promised in time to build some bodies in April in advance of car production, according to Frazer. The company hopes ultimately to build most of the components which will go into the car. Original plans for Monroe Auto Equipment to build the torsion bar suspension system for the Kaiser have been

changed, and Kaiser-Frazer is tooling to build the unit in its own plant.

Expansion Program at Caterpillar Tractor Co.

The largest expansion program in the history of Caterpillar Tractor Co., one that will enlarge the floor area of the Peoria, Ill., plant by nearly 50 per cent, is revealed in an announcement by L. B. Neumiller, president of the company.

Scheduled to be carried out progressively so that production can be increased as soon as possible, the expansion is expected to permit manufacture of more tractors by September of this year.

Completion of the undertaking, which will add approximately 180 million sq ft of floor space—about 41 acres—to the Peoria plant, is planned for the summer of 1948.

Steel Production Rate

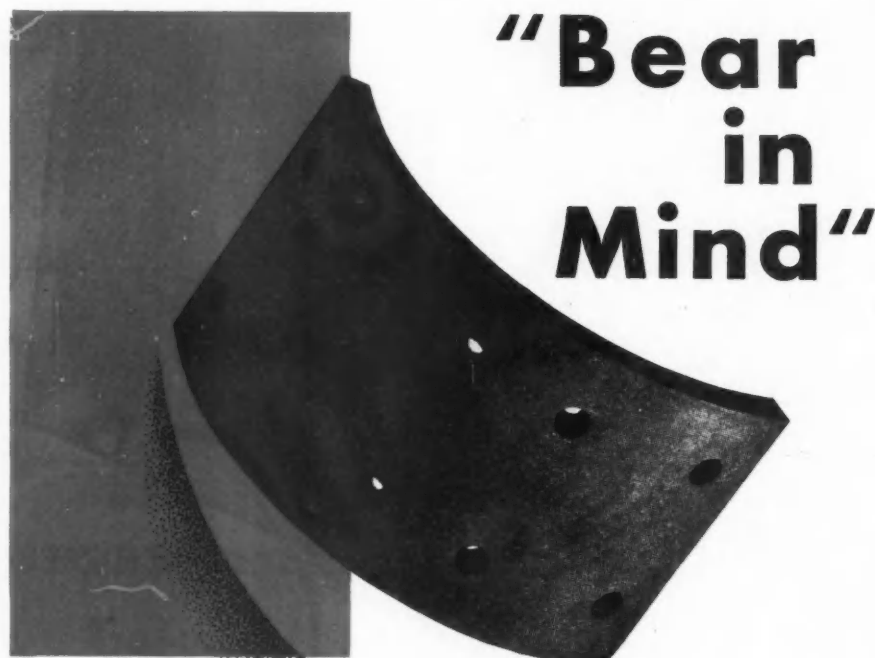
The operating rate of steel companies having 94 per cent of the steel capacity of the industry was 78.3 per cent of capacity for the week beginning April 8, compared with 87.1 per cent the week before, 83.6 per cent one month earlier and 94.3 per cent one year ago.

This represents a decrease of 8.8 points or 10.1 per cent from the preceding week.

OPA Car Prices

(Continued from page 72)

	New	Old
DE SOTO DE LUXE		
4 door sedan	1169	1168
2 door sedan	1139	1138
3 passenger coupe	1061	1060
Club coupe	1161	1160
DE SOTO CUSTOM		
4 door sedan	1230	1229
2 door sedan	1204	1203
Club coupe	1220	1219
CHRYSLER ROYAL		
4 door sedan	1265	1264
2 door sedan	1237	1236
3 passenger coupe	1143	1142
Club coupe	1262	1261
CHRYSLER WINDSOR		
4 door sedan	1353	1352
2 door sedan	1302	1301
3 passenger coupe	1205	1204
Club coupe	1317	1316
CHRYSLER EIGHT CYLINDER		
Saratoga		
3 passenger coupe	1429	1428
2 door sedan	1496	1495
Club coupe	1517	1516
4 door sedan	1530	1529
NEW YORKER		
3 passenger coupe	1521	1520
2 door sedan	1588	1587
Club coupe	1591	1590
4 door sedan	1604	1603
NASH		
"600" Series		
4649	995	987
4643	1047	1038
4648	1051	1041
Ambassador 6 Series		
4669	1083	1084
4663	1174	1165
4668	1188	1179



GRIZZLY

REG. U. S. PAT. OFF.

A DEPENDABLE BRAKE LINING SOURCE

Thirty years experience in the manufacture of brake lining has established Grizzly as a dependable source of supply for molded brake lining of uniformly high quality.

Many leading production, engineering and purchasing men depend on Grizzly's experience, flexibility and constant research

and engineering developments for the solution to their brake lining problems. They "bear in mind" that Grizzly plants employ the most modern mass production techniques, are adequately manned and capably managed. They know for fine brake lining and expert counsel they can depend on Grizzly!



GRIZZLY MANUFACTURING COMPANY

PAULDING, OHIO

PLANTS AT PAULDING AND BELL, CALIF.

Warehouse Stocks in Principal Cities



5 Microinches RMS! Under the diamond-tipped tracer stylus of an infinitely sensitive surface analyzer, Permite Piston Pins are measured for smoothness — to the Permite standard of .000005" RMS.

CENTERLESS ground and lapped to a standard surface finish of 5 Microinches RMS, Permite Piston Pins measure up fully — and then some — to their high responsibility in the new automotive, industrial and marine engines. The carefully maintained quality of these vital little links of power transmission makes Permite Piston Pins first choice among leading engine builders and manufacturers of cars, trucks, buses and tractors.

Like all Permite Steel Parts, Permite Piston Pins are engineered of highly core-refined steel, accurately case hardened. The uniformity of their properties is scrupulously maintained. For size that matches the excellence of their finish, they are held to the fine tolerance of .0002".

The better engines of today are being built for longer life than ever with Permite Piston Pins — and other Permite hardened, ground and forged Steel Parts. Permite engineers, with their modern development and production facilities, are at your service.



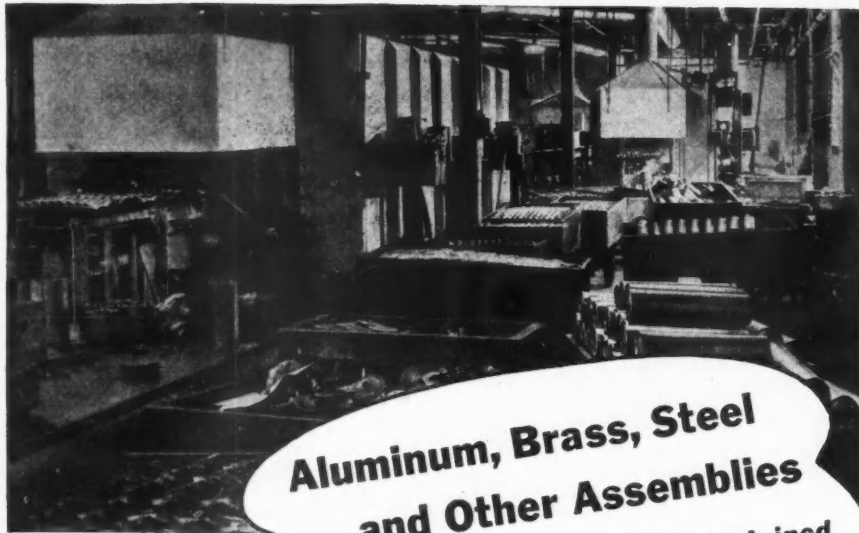
PERMITE

ALUMINUM INDUSTRIES, Inc.
Cincinnati 25, Ohio

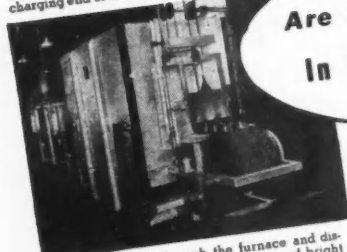
ALUMINUM INDUSTRIES, INC.

CINCINNATI 25, OHIO

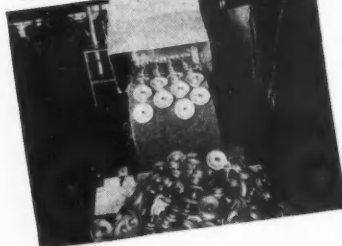
DETROIT: 809 New Center Building. NEW YORK: 9 Rockefeller Plaza. CHICAGO: 416 South Michigan Ave. ATLANTA: 413 Grant Building
ALUMINUM PERMANENT MOLD, SAND and DIE CASTINGS...HARDENED, GROUND and FORGED STEEL PARTS



The assemblies are loaded on a conveyor at charging end of the furnace as shown below



... and carried through the furnace and discharged—securely joined—clean and bright



We will be glad to put samples of your products through one of our furnaces to show you the results you can expect, and give you an estimate on the cost of the equipment to handle your product.

Send for printed matter showing various types of EF brazing furnaces.

Aluminum, Brass, Steel and Other Assemblies Are Securely and Economically Joined In EF Soldering and Brazing Furnaces

Products ranging in size from small intricate assemblies weighing a fraction of an ounce up to large assemblies weighing several pounds are being neatly and securely joined in EF continuous and batch type brazing and soldering furnaces.

Products which otherwise would be difficult or expensive to make in one piece are being made in several pieces and brazed.

Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, are being neatly and economically joined, right in the production line.

Strong, leak-proof joints are made and the completed units are discharged from these furnaces—clean and bright. Any number of joints in the same product or any number of pieces can be joined at one time.

Investigate This Process for Joining Your Aluminum, Brass, Copper or Steel Parts.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces—For Any Process, Product or Production

**For Production Furnaces
For Handling Products in
Any Size or Shape**

FURNACES OIL, GAS or ELECTRIC For Every Heating and Heat Treating Process

Aluminum Brazing
Annealing
Billet Heating
Bright Annealing
Bright Hardening
Copper Brazing
Controlled Atmosphere

Carburizing
Drawing
Enameling
Forging
Hardening
Malleablizing
Silver Soldering

Nitriding
Normalizing
Soaking Pits
Scale-Free Hardening
Quenching Machines
Ceramic Kilns, etc.
Process Heating

**We Build the Furnace to Fit Your Job
THE ELECTRIC FURNACE CO.
SALEM, OHIO**



**For Production Furnaces,
For Any Process or Production, Consult
The Electric Furnace Co., Salem, Ohio
No Job Is Too Large or Too Unusual**

New Era Exposition

(Continued from page 50)

ers and Swiss jig borers. Abrasives, abrasive wheels, diamonds, ferrous and non-ferrous materials and tool steels, cutting fluids, materials handling devices, and various types of fixtures also were shown.

Generally speaking the exposition constituted a roundup of late developments, most of which were quite familiar to the users. Here and there, however, manufacturers had an opportunity to show new products for the first time, some of these being mentioned briefly for the record. Pratt & Whitney showed its Selectronic sorting machine fitted with an Electrolimit gaging head for the automatic sorting of balls and small cylindrical pieces to an accuracy of 0.00004 in. Bendix-Westinghouse Automotive Air Brake Co. demonstrated applications for its air brake cylinders adapted for air-clamping work fixtures for machine tools.

Andrew C. Campbell Division of American Chain & Cable Co., Inc., had on display the Campbell Autocutter, said to be the first example of a fully automatic abrasive cutting machine. Buckeye Tools Corp. had its first showing of the Buckeye Ace-Cycle electric portable tools of 60 cycle, 3-phase type. An interesting means for producing a radial relief on forming tools and taps was shown in the D-S fixture and grinder made by the Royal Oak Tool & Machine Co. Jack & Heintz featured its new line of fractional horsepower electric motors of unique design. A new dry direct process printing and developing machine for whiteprints was exhibited by the C. F. Pease Co.

An air feed attachment for sensitive drilling and milling operations was featured by the Bellows Co. Moore Products Co., producers of a line of pneumatic comparator gages, announced a new comparator with adjustable compensation for varying amplification of readings. Karge & Son Machine Co. drew attention to a patented process for producing precision-turned extremely long and slender parts of metal or plastics.

To facilitate the optical measurement of flatness of plane surfaces, the Optron Laboratory displayed its new Optron interference viewer. The Limatron electronic comparator for the sorting and view of production parts was shown by the Pollak Mfg. Co.

A well rounded series of technical sessions highlighted the meeting's activity, one of the most interesting innovations being a full session devoted to papers and discussion of cutting fluids and their utilization. Supplementing this session was an annual meeting of the Independent Research Committee on cutting fluids held under the chairmanship of Joseph Geschelin, Detroit Editor, AUTOMOTIVE AND AVIATION INDUSTRIES.

★ SUPERB ★

OIL RESISTANCE

is only one of Hycar synthetic rubber's unusual and valuable properties. Others are listed in the box at the right.

But most important, these properties may be had in an almost limitless number of combinations, each designed to meet specific service conditions of the finished Hycar part.

Our files contain more than 5000 recipes for Hycar compounds—each compound engineered to do a certain job. Parts made from HY-

CAR have seen service in *every* industry, giving long life, dependability, and economical operation.

That's why we say, ask your supplier for parts made from Hycar. Test them in your own application, difficult or routine. You'll learn for yourself that it's wise to use HY-CAR for long-time, dependable performance. For more information, please write Department HH-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. **EXTREME OIL RESISTANCE**—insuring dimensional stability of parts.
2. **HIGH TEMPERATURE RESISTANCE**—up to 250° F. dry heat; up to 300° F. hot oil.
3. **ABRASION RESISTANCE**—50% greater than natural rubber.
4. **MINIMUM COLD FLOW**—even at elevated temperatures.
5. **LOW TEMPERATURE FLEXIBILITY**—down to -65° F.
6. **LIGHT WEIGHT**—15% to 25% lighter than many other synthetic rubbers.
7. **AGE RESISTANCE**—exceptionally resistant to checking or cracking from oxidation.
8. **HARDNESS RANGE**—compounds can be varied from extremely soft to bone hard.
9. **NON-ADHERENT TO METAL**—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATELY PRODUCED BUTADIENE TYPE

Synthetic Rubber

B. F. Goodrich Chemical Company

A DIVISION OF
THE B. F. GOODRICH COMPANY

April 15, 1946

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89

50 Years Ago

(Continued from page 19)

successful. In 1899 he was one of the founders of the Detroit Automobile Company, but withdrew after about twenty cars had been sold and, in 1902, the company was taken over by Cadillac. The present Ford Motor Company began operations in 1903.

R. E. Olds is credited with having done his earliest work in building automobiles in 1895. In 1897 the Olds Motor Works was organized in Lansing and in 1899 it was moved to Detroit.

Once there and all set to go, a fire destroyed its plant with the result that the first cars were eventually turned out in 1901. They were curved-dash runabouts with single cylinder engines and they were in the "best seller" class in their day. Altogether 425 of them were sold that year at \$650 each.

J. W. Packard, on a challenge from Alexander Winton, made what he, at least, thought was a better car than the Winton he had bought in 1898 and

the first Packard appeared as a product of the Ohio Automobile Company, of Warren, Ohio, in late 1899. In 1902 the company name was changed to its present form and a year or so later manufacturing activities were moved to Detroit.

Pre-eminent among the many men whose special contributions yielded benefits of incalculable value in the development of the automobile are the two Henrys, Ford and Leland, both of Detroit. Ford led the way in low-selling price mass production; Leland, in precision manufacturing on a quantity production basis. The combination of the two is the common practice of today and still is an outstanding achievement of this mechanical age, a marvel of human accomplishment.

Ford, in the earliest days of automobile manufacturing, was impelled by an ambition to build the automobile for the masses. It is reported that he fell out with his associates in the Detroit Automobile Company in 1900 because of a difference of opinion with respect to policy in that regard. At that time, automobiles were built rather than manufactured. Production costs were high and selling prices correspondingly higher. Ford saw clearly that costs could be reduced as production was increased and that the only hope of making a low-priced car which everyone could buy lay in making thousands, not dozens, of them. He could see the market waiting and ready to take these thousands of cars if the price was right. He nursed the idea and by ingenuity and persistency finally succeeded in providing himself with the means for making his dream come true. Thereby he changed the thinking and the outlook of the entire industry and put it on a radically different basis.

Henry Leland, a fine machinist with a New England background, was an apostle of precision. He showed the industry the importance of close tolerances in machine-finished parts. He demonstrated the value of absolute interchangeability and on one occasion he did so dramatically. In 1906 he shipped three Cadillacs to England to show our doubting British cousins that mass production and precision manufacturing could be and actually were being successfully combined. These three Cadillacs were completely torn down. No two parts of any one of them remained together. The parts were thoroughly scrambled. Three cars were again assembled from the mass of parts. They were immediately run in a 500 mile test on Brooklands track and all came through with perfect scores. Even American eyes were further opened but British eyes were opened wider. They had been closed to the possibilities before.

Henry Ford did another major service to the industry. He successfully fought the Selden patent. On May 8, 1879, George B. Selden, of Rochester, N. Y., had applied for a patent on a "Road Engine." The patent soaked in the patent office for sixteen years and

(Turn to page 92, please)

Johnson

TAPPETS



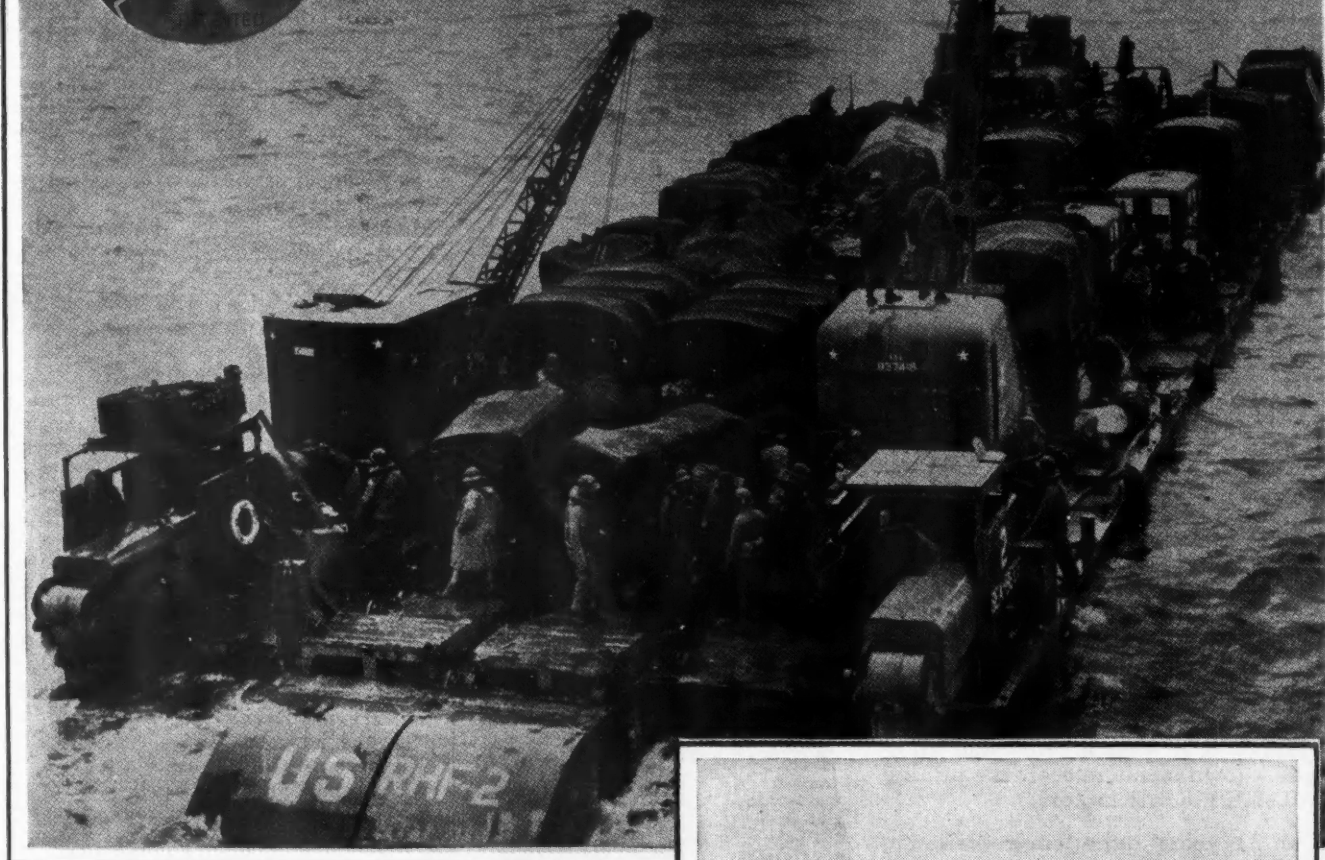
JOHNSON manufactures Hydraulic Tappets, Self Locking Adjustable Tappets, and conventional Adjustable Tappets... JOHNSON builds tappets to your designs and specifications... Let JOHNSON assist you in your tappet design problems.

(The above illustration is a sectional and exploded view of JOHNSON Hy-Precision Hydraulic Tappet.)

JOHNSON PRODUCTS, INC.

MUSKEGON HEIGHTS, MICHIGAN

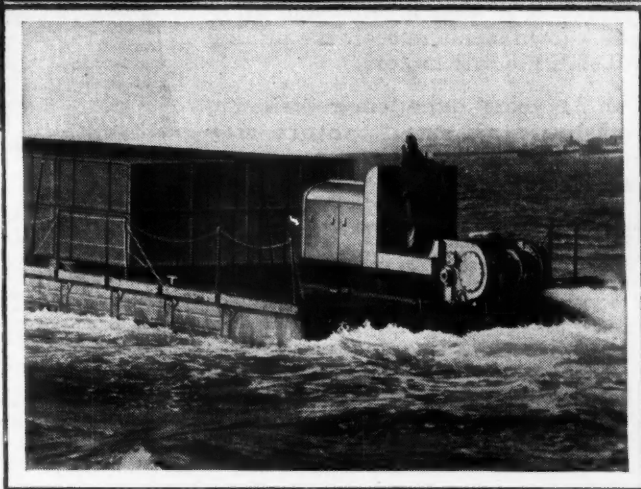
"PERFECT" SEALS *Score AGAIN*



In war and now in peace, the Murray Tregurtha "HARBORMASTER" Propulsion Unit established and is maintaining very enviable records for dependable service in the harbors and on the rivers of the world.

Contributing to its dependability are the "Perfect" Oil Seals which the designers of this unit selected to exclude sea water from the mechanism and to retain its lubricant within. On land, sea and in the air, "Perfect" Oil Seals can be depended upon to protect vital mechanisms at a cost that is negligible.

Consult Chicago Rawhide engineers in regard to your sealing problems. Their experience is greater than that of any other group in the industry.



2045

CHICAGO RAWHIDE MANUFACTURING COMPANY

1310 ELSTON AVENUE • CHICAGO 22, ILLINOIS

PHILADELPHIA • CLEVELAND • NEW YORK • DETROIT • BOSTON • PITTSBURGH • CINCINNATI

66 YEARS MANUFACTURING QUALITY MECHANICAL LEATHER GOODS EXCLUSIVELY AND NOW SIRVENE SYNTHETIC PRODUCTS

was finally issued on Nov. 5, 1895. Selden claimed that this patent covered any automobile driven by "any form of liquid-hydrocarbon engine of the compression type." He convinced a number of the leading automobile manufacturers in 1903 that that was a fact. They took out licenses and organized an association as will be mentioned later. Ford was sued for infringement and so were several others as sellers and as users including also a foreign manufacturer, Panhard & Levassor, whose cars were being imported. Round I went to the plaintiffs. On Sept. 15, 1909, U. S. Circuit Court Judge Hough said the patent was not

only good but covered the defendants' automobiles. An appeal was taken and, just as the 1911 New York show of licensed automobiles was opening, the Circuit Court of Appeals threw a bombshell into the proceedings by saying that the patent was valid but not infringed. Henry Ford was the guest of honor at his rivals' show banquet that week and smoked the pipe of peace with Charles Clifton of Pierce-Arrow, who was president of the Association of Licensed Automobile Manufacturers. Ford did more than that. As a result of his stubborn and successful fight harmony was restored within the industry.

Before the Selden patent became an instrument of dissension, unity, so far as it can be indicated by organization, prevailed in the industry. The National Association of Automobile Manufacturers, which was organized late in 1900, had for its members most of the leading manufacturers. It was the young industry's focal point so far as things affecting the industry as a whole were concerned. It had at one time nearly forty member companies. It conducted the early shows, the first one, held in Madison Square Garden, New York, in November, 1900, having been sponsored and promoted by the Automobile Club of America. The N.A.A.M., among its other accomplishments, drew up and adopted the first standard form of manufacturer's guarantee for automobiles which limited liability to sixty days and covered only defects in workmanship and materials.

Then came the day when the matter of the Selden patent exploded. Those manufacturers who had taken out licenses under the patent, organized the Association of Licensed Automobile Manufacturers in 1903 and after a few years the membership grew to a total of thirty-eight.

The other fellows who believed that the Selden patent was not hole-proof formed a cocky, not-so-little association of their own and called it the American Motor Car Manufacturers Association. That was in 1905 and, during its lifetime, its membership varied from 20 to 45 in the number of companies represented.

For a number of years the A.L.A.M. conducted automobile shows in New York and Chicago and so did the A.M.C.M.A. In New York, the A.L.A.M. held forth in old Madison Square Garden. Their rivals had Grand Central Palace.

And now we come to the time when the Selden patent was recognized by everyone as good, but not good. The two patent-inspired associations were washed out and, in April, 1911, the Automobile Board of Trade was organized. Its existence as such was terminated two years later when, in reorganized form and with enlarged membership, it, or rather its successor, emerged as the National Automobile Chamber of Commerce, which, chiefly through a change of name, became the present Automobile Manufacturers Association in 1934. Alvan Macauley, who had been elected president of N.A.C.C. in 1928, continued as president of the A.M.A. until he resigned after 18 years of service, in February, 1946.

Detroit and all the rest of the country may well celebrate the 50th Anniversary of the automobile industry which has, since 1900, produced 88,979,327 passenger cars and trucks with a wholesale value of more than \$62,342,000,000. And that is by no means a full measure of its greatness and of its contribution to the general welfare. The parts, accessory and shop equipment branches of the industry come (Turn to page 94, please)

What QUALITIES do you want
in Your New Products ?
a Lamb Electric MOTOR
will help provide

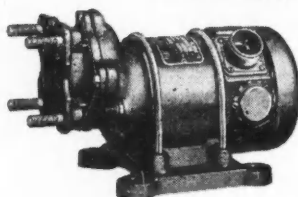
Probably no part of a motor-driven product has more influence on the design and operation features than the motor itself. That is why, in planning for the sharp sales competition that is ahead, more and more well-known manufacturers are turning to Lamb Electric motors.

Our 31 years' experience designing and building small motors may prove valuable to your engineering department.

THE LAMB ELECTRIC COMPANY
KENT, OHIO



Typical applications for this motor: industrial vacuum cleaners, agitators, sirens and colloid mills.



Base-mounted, explosion-proof aircraft geared fuel transfer pump motor.

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Standard analyses in standard sizes carried in stock for immediate delivery. Special steels developed for special purposes. Save time—consult Jessop on all of your die steel requirements. Descriptive literature sent free upon request.

JESSOP STEEL COMPANY

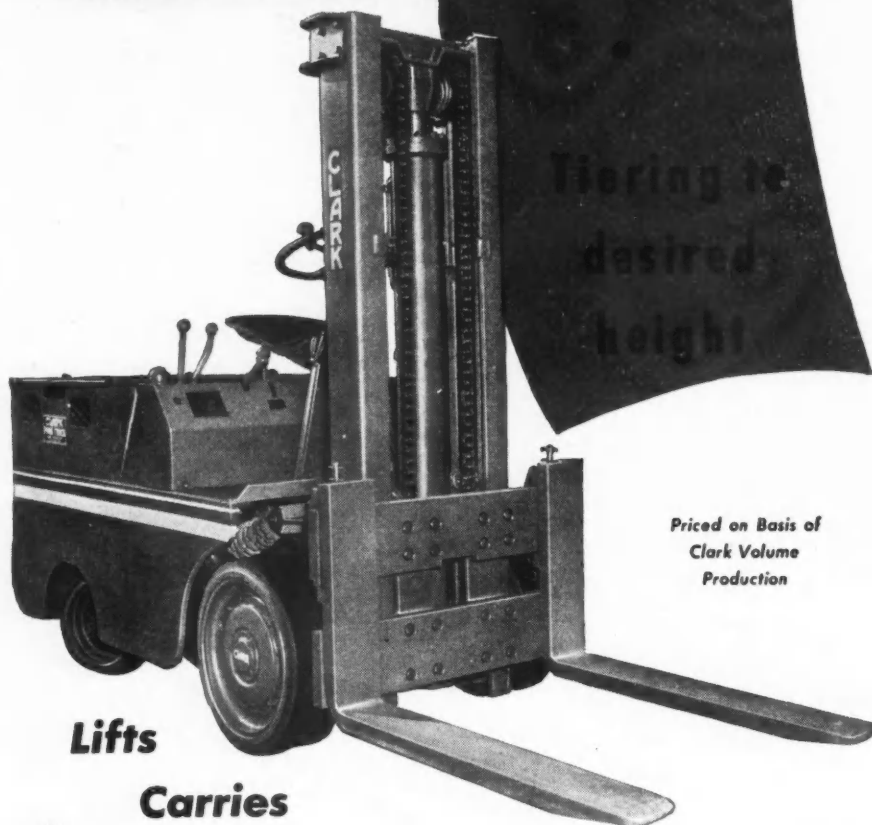
WASHINGTON, PENNSYLVANIA

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bined have added almost equally to our wealth and well-being. Allied and feeder industries have profited also by its growth and success. Millions of jobs have been provided directly and indirectly by it—jobs that it created. The whole country has profited in more ways than can be counted from the work and inspiration of the automobile pioneers and the men who carried on. It is time the country recognized fittingly what it owes them.

Allis-Chalmers

Temperature Tests

(Continued from page 29)

thus eliminating exposure of any of the bearings to the hot gases. Provision is made for cooling in the bearing supports.

A special feature is the cooling arrangement at the high pressure end of the turbine spindle. Adjacent to the first stage turbine wheel is a disk with a series of holes in the periphery that directs cooling air on the face of the wheel web, the air flowing radially inward where it is collected by a center pipe that leads to a water-cooled heat exchanger. A pressure blower returns the cooled air through the outer pipe to the disk and turbine wheel.

For cooling the web of the second stage wheel, air is directed toward the periphery and then flows through radial holes to an annular passage around the center portion of the wheel web and then through a series of holes that allow the cooling air to blow on the downstream face of the high pressure wheel.

Blades and webs of the turbine wheels are made of a Timken high temperature alloy steel, which includes 16 per cent chromium, 25 per cent nickel and six per cent molybdenum. The heavy stationary parts of the turbines are an alloy steel containing 25 per cent chromium and 12 per cent nickel.

Handling of the hot gases in the combustion chamber and piping them to the turbines presented a major problem in preventing loss of heat energy and weight loss. This was solved by designing them with an inner and outer wall, between which is a thick section of mineral block insulation, which maintains a temperature drop sufficient to use the high physical properties of the outer wall metal.

Jack & Heintz to Move Production to Cleveland

William S. Jack, chairman of Jack & Heintz Precision Industries, Inc., has announced plans that will bring to his seven Cleveland plants the production of three eastern plants united with Jack & Heintz in the merger with the Eisemann Corp.



Hoisting Homocarb-cyanided bearing cones, for Columbia bicycles, out of Homocarb Furnace.

Quenching cones directly from Homocarb Furnace. Surfaces are clean except for easily-removed quench stain; quality is high and rejects negligible.

BETTER CYANIDING FOR SMALL PARTS

Production men who are planning the heat-treatment of small parts will find four advantages to users of Homocarb Gas Cyaniding:

Certainty of High-Quality Results. The fully-automatic controls of Gas Composition, Temperature, Gas Circulation and Time of Treatment remove the variables from cyaniding. The process is as accurately performed as are parts-machining operations.

Safety. The cyaniding media used are Homocarb Fluid and ammonia, both fed from closed containers directly into Furnace. No spluttering chemicals in the quench tank—only water can splash out.

Can Go In Production Line. Conveying and handling to a remote heat-treat department can often be reduced by putting the clean, safe, compact Homocarb right in the production line.

Economy. No loss of cyaniding medium by carryover to the quench. Highly uniform action in the Furnace reduces rejects very sharply; may end them altogether. Smooth surfaces require only minimum of finishing.

An L&N engineer will be glad to help you apply Homocarb to a specific problem; or will send Catalog T-623, as you prefer.



LEEDS & NORTHRUP COMPANY, 4966 STENTON AVE., PHILA. 44, PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

Jrl Ad T-623(22)

New Products for Aircraft

(Continued from page 48)

personal airplanes using engines up to 200 hp. The propeller is to be made in three sizes for 85, 125 and 185-hp. engines. The 85-hp. size is now in production and larger sizes will be available later this year.

Continental Aviation's controllable pitch propeller utilizes a double acting hydraulic mechanism controlled from the instrument panel to shift the blades into either high or low pitch.

All-Purpose Aircraft Grease Announced

A new general purpose aircraft grease which is said to provide satisfactory lubrication between temperature extremes of -40F and 250 F is announced by The Texas Co. Known as Regal Starfak Special, it is approved under Army-Navy Aeronautical Specification An-G-15.

It is designed for general lubrication of military and commercial aircraft in such widely varied applications as landing gears, wheel bearings, control bearings, propeller hubs, magneto and generator bearings and gears. Developed originally to meet Army and Navy requirements brought about through the newer types of military aircraft, the lubricant is now rapidly being adopted for use on commercial transports.



STERLING-

Specialists in Aluminum Permanent Mold Castings

Sterling's modern foundry, patented molding process, quality materials, and expert workmanship have been, for years, producing the finest in aluminum pistons.

This same expert workmanship and patented molding process has enabled us to develop many special permanent mold aluminum castings for the automotive and aviation industries.

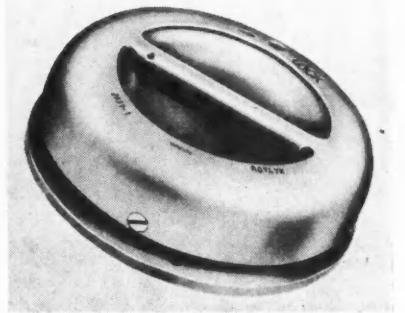
Wherever a minimum of finishing and light weight is a factor, our engineers' experience will be of value to you in developing a permanent mold aluminum casting to economically meet your requirements. Call or write

STERLING ALUMINUM PRODUCTS INC.
St. Louis 6, Missouri

Positive-Locking Caps for Airplane Fuel Tanks

Positive-locking airplane fuel tank caps that provide a 4-in diameter hose clearance with an overall diameter of 5½ in. are offered by Roylyn, Inc., Los Angeles, Cal.

Both the recessed and flush type models consist of a base and cap, the latter containing a cam, ball cage and gasket. When the cap is positioned for locking, a quarter-turn activates the cam collar forcing steel balls inward against the groove in the base locking the halves together. The gas-



Roylyn fuel tank cap

ket, retained in the ball cage, provides a positive seal as well as acting as the separating spring force required to operate the lock.

Vibration will not spring the lock as only relief of the cam will release the pressure on the groove. Both visual and audible checks indicate cap position. Provisions for safety chain and fuel strainer are included. The Roylyn stainless steel strainer, which fits into the cap base, ranges in lengths to 30 in. and will not collapse under normal fuel surging.

Advertising Note

Appointment of Charles H. Gale Associates, Inc., as public relations counsel for Piper Aircraft Corp., was announced by W. T. Piper, president. Gale Associates assumed conduct of Piper's public relations April 1.

FOR WORK UNIFORMS THAT STEP UP EFFICIENCY—DEMAND

REEVES ARMY TWILL

"FROM COTTON TO CUTTER"



Now you can specify durable, smart looking Reeves Army Twill for uniforms and work clothes. Its high tensile strength insures rugged wearability. It tailors smartly, too, and is color-fast to sun, water and perspiration. Sanforized Shrunk*, it is the fabric for long-lasting economy. Remember—over 90 million yards of this same fabric helped equip America's fighting men—exceeding Government specifications under the toughest climatic and combat conditions.

*Residual shrinkage less than 1%

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Mills Mill, Greenville, S. C. and Woodruff, S. C.
Fairforest Finishing Co., Spartanburg, S. C.

REEVES BROTHERS, INC.
54 WORTH STREET • NEW YORK 13, N. Y.



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April 15, 1946

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97

New Production and Plant Equipment

(Continued from page 42)

tion, is timed to coincide with the start of operation of the work tools.

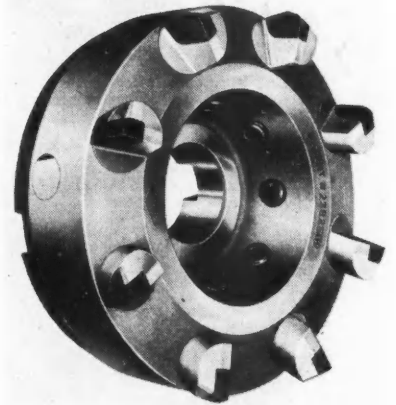
Power for its operation is taken from the standard lathe lead screw and transmitted, by means of a roller chain and steel sprockets, through a steel worm and bronze worm gear.

A LINE of standard "Vibra-Cushioned" face milling cutters with carbide tipped inserted blades has been introduced by Tungsten Carbide Tool Co.,

2661 Joy Road, Detroit 6. The carbide tips on the blades are extra thick in order to give maximum strength. A round steel blade, to provide more effective backing for the tip, is used. The blade is wedge-locked into a cutter body, which, in addition to being slightly heavier than conventional milling cutters as to total weight, has the weight distributed in such a manner as to provide the maximum "flywheel" effect.

Use of inserted round blades has made possible designing the cutter body without external slots. Elimination of these slots is said to impart a high degree of rigidity.

The new line is produced for National Standard Drive only. Four standard sizes—six, eight, ten and 12 in.



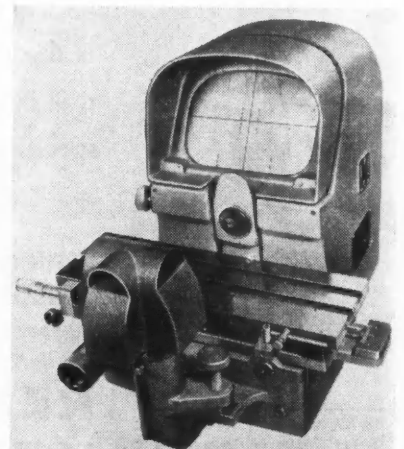
"Vibra-Cushioned" face milling cutter

O.D.—are offered, each in both left-hand and right-hand types. Blades are designed specifically for each size and both blades and cutter bodies are carried in stock by Tungsten Carbide Tool Co.

Six in. O.D. cutters are designed for drive through keys, while larger cutters are designed for bolting to milling machine spindles, being counterbored to fit over the spindle.

JONES & LAMSON MACHINE CO., Springfield, Vt. has brought out three new comparators. These comprise:

A standard bench comparator, Model BC-6, with 6x8 in. screen (approx.) and a table for making lateral measure—(Turn to page 100, please)



Jones & Lamson bench comparator model BC-6



OVER A MILLION AUBURN CLUTCHES IN SERVICE
AUBURN MANUFACTURING COMPANY
DIVISION OF ATWOOD VACUUM MACHINE COMPANY,
AUBURN, INDIANA, U. S. A.

Free - to makers of Automotive and Aviation Equipment ...a guide to "ready-made" training films

This new list includes 668 films that will help you train aircraft and automotive workers, and which can be borrowed, rented, or purchased reasonably

There's nothing like your own training films for teaching workers *your* methods. But if you cannot have all of your films produced, you can still make great use of this time-saving, detail-explaining, skill-building instruction method . . . by including in your program films made by others.

And that's where this new book, "The Index of Training Films," can help you. It lists 1700 motion-picture and sound-slide films which include 294 on aircraft construction and maintenance; 112 on repair and maintenance of automotive equipment; 204 on machining; 34 on sheet metal; 24 on foundry practice; others on lubrication, ignition, and related automotive subjects.

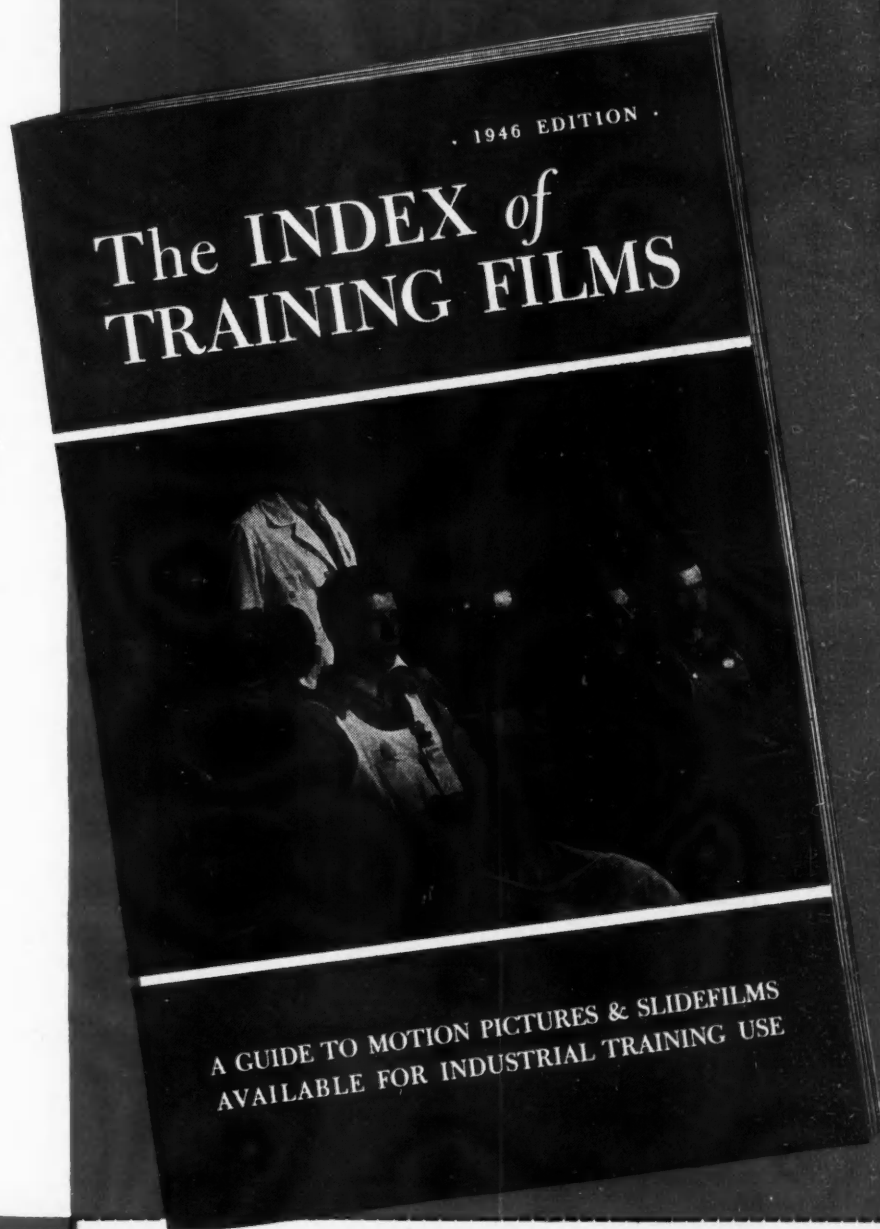
This informative reference book describes and classifies outstanding films in these fields . . . tells which are free . . . which can be rented or bought, for how much, and from whom.

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FOR DURABLE
LUSTROUS FINISH

**CHEMICALS
ACP
PROCESSES**

ACP Processes and Chemicals make possible durable paint finishes on automobiles, refrigerators, washing-machines, aeroplanes, farm machinery and other metal products requiring protective paint finish.

COLD SPRAY-GRANODINE produces a dense smooth phosphate coating that protects steel and paint for a durable, lustrous paint finish.

THERMOIL-GRANODINE creates a heavy coating of iron and manganese phosphate which when oiled retards corrosion and prevents excessive wear on friction surfaces. When painted provides unusual protection.

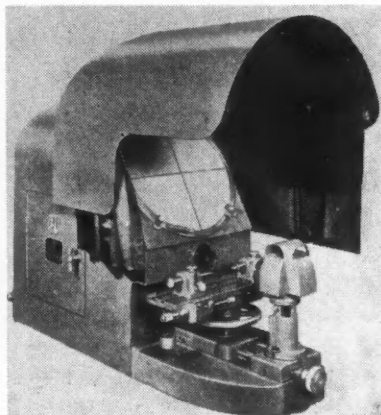
210 B DEOXIDINE assures proper cleaning and a thin, tight and relatively hard phosphate coating so essential to a bright enduring paint finish.

DEOXIDINES—There are other Deoxidines that remove rust, clean and condition for painting.

LITHOFORM—a phosphate coating that bonds paint to galvanized, zinc or cadmium coated surfaces.

American Chemical Paint Co.
AMBLER **ACP** PENNA.

ments of lead or spacing up to 2 in. This table can also be compounded 5 deg. either way when inspecting objects with helices. If a table for making lateral measurements is not desired, this model can be furnished with a table, with no lateral movement, that can be compounded when inspecting objects with helices. Or, with a plain fixed table when needed for comparison inspection only.



Jones & Lamson bench comparator model BC-5

A bench comparator, Model BC-5, with a 14-in. diam. screen and a table for making measurements of lead or spacing up to 2 in. If desired, this model can be supplied with a fixed table without measuring attachments. It will accommodate objects held between centers up to 3 in. diam. and 8 in. long.

A vertical optical comparator, VC-2, with a 14-in. diam. screen and a coordinate measuring table for measuring flat objects. This model can be supplied without the coordinate measuring table when it is to be used for comparison inspection only.

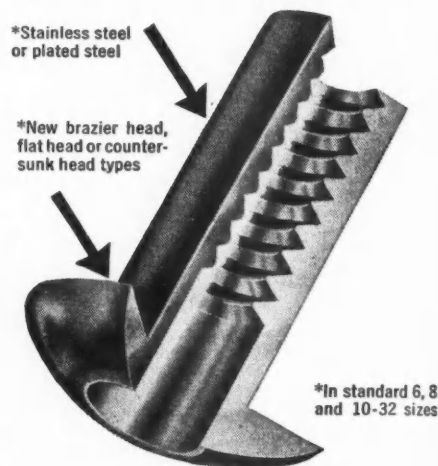
(Turn to page 102, please)



Jones & Lamson optical comparator model VC-2

STEEL RIVNUT NOW AVAILABLE

for
tough fastening problems



New addition to line broadens field of Rivnut applications

HERE IT IS... in stainless or plated steel—the one-piece blind rivet complete with screw threads that can be used both to fasten *with*, and to fasten *to*.

Standard Rivnut hand tools, with a slight adjustment, can be used to install 6, 8 and 10-32 sizes.

All Rivnuts, used as rivets, can be sealed with a drive plug (hammered in place) or with a plug screw, which keeps the threads intact. If used for attachment, cadmium-plated attachment screws are available.

WRITE FOR HANDBOOK

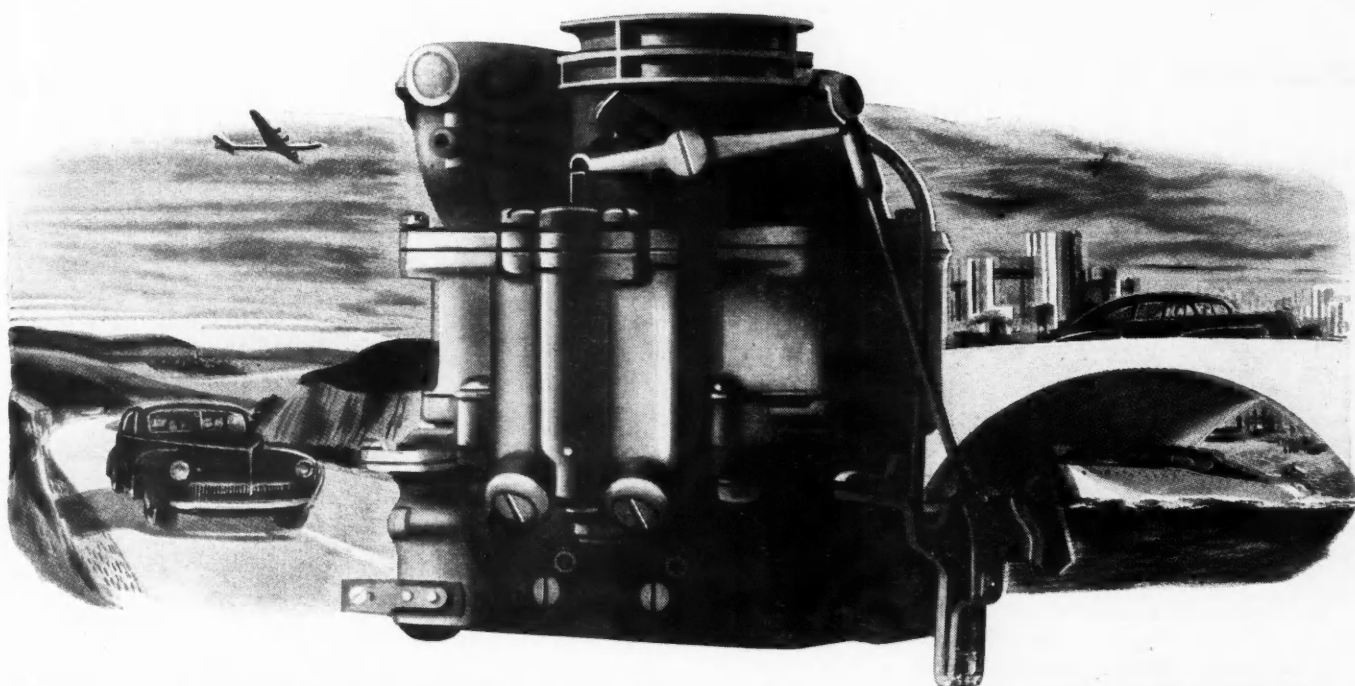
Principle of Rivnuts, installation procedures, complete test data on lighter aluminum Rivnuts and new supplement on brass and steel Rivnuts, available free. Ask for Rivnut Data Book. The B. F. Goodrich Company, Dept. AI-4, Akron, Ohio.



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gasoline
GOES**

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REG. U. S. PAT. OFF.



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reliable carburetion

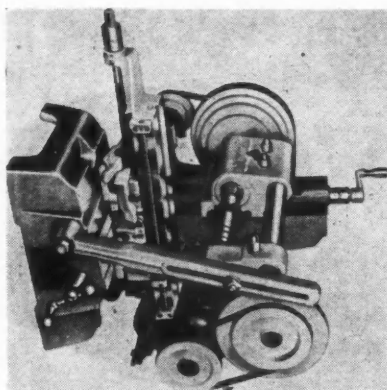
BENDIX AVIATION CORPORATION • Fisher Building, Detroit 2, Michigan



April 15, 1946 *When writing to advertisers please mention AUTOMOTIVE and AVIATION INDUSTRIES*

THE Armor milling machine, built by Aircraft Machinery Corp., Burbank, Cal., weighs 320 lb stripped. It has a rise and fall spindle, eliminating the use of a knee. Features also include both horizontal and vertical spindles, precision Timken adjustable bearing equipped. The horizontal spindle nose is designed with standard lathe threads externally for lathe operations, such as mounting chucks and face plates. It will swing 22 in. Small bar stock can be fed through the taper spindle. Jig boring can be done using rods and indicator.

Hand screw feed is standard equip-

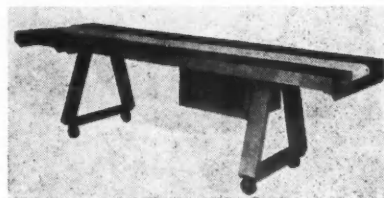


Armor milling machine

ment, but lever feed assembly can be used in place of lead screw, converting from tool to production milling. A fully-automatic power feed is available which drives the table in either direction, independent of spindle rotation, through a totally enclosed, reversible gear box. The Armor bench mill has 12 in. longitudinal, 10 in. vertical, and 7 in. cross travel.

WHAT is claimed to be an all-purpose conveyor-merchandized work table for assembly, inspection and packaging operations is being offered by the Island Equipment Corp., 101 Park Ave., New York 17, N. Y. As it can be assembled in as many units as may be desired, this conveyor has been named the "Unitable."

It can be lengthened, shortened, or moved with ease and speed. Side leaves



The Unitable

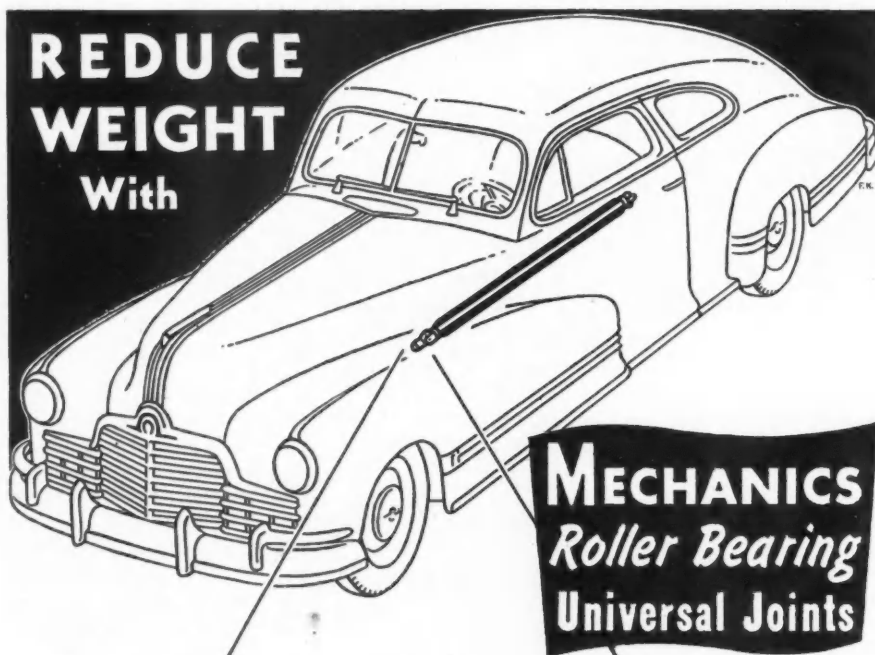
can be added or removed from either side from an entire line or from any number of units in a line.

This flexibility is made possible by the unitized "bolted" construction. Any required combination of units involves only the removal or application of a few bolts.

A RECENT development of the Super Tool Co. of Detroit, Mich., is a face milling cutter, using solid carbide blades. Only one type of body is required for machining any and all materials, the only variation being in the angles ground on the solid carbide blade, which can be readily altered to
(Turn to page 104, please)



Face milling cutter made by Super Tool Co.



Because the conventional splined stub shaft is eliminated in this **MECHANICS** Roller Bearing **UNIVERSAL JOINTS** and Tubular Shaft assembly, an appreciable weight reduction is accomplished. Let our engineers show you how this and other **MECHANICS** features will help give your product competitive advantages.



MECHANICS UNIVERSAL JOINT DIVISION

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2020 Harrison Avenue, Rockford, Ill. Detroit Office, 7-234 G. M. Bldg.

19 Cylinder Liners Finish Bored Every Hour

**PRODUCTION SPEEDED AND COSTS LOWERED
WITH W. F. AND JOHN BARNES VERTICAL
BORING MACHINE AND SPECIAL FIXTURE**

Four cylinder liners, each 15-3/64" long, are *finish bored* on this W. F. and John Barnes Vertical Boring Machine, with dimensions held to 5.748"-5.746". In an hour, including loading time, 19 cylinders are machined. Two Barnes Vertical Boring Machines are used on this job, allowing the operator to load one machine while the other is in operation.

The simultaneous boring of four cylinder liners increased production substantially and reduced manufacturing costs materially. Engineering collaboration enabled this tractor manufacturer to use their own facilities to speed delivery of these machines. While Barnes built the basic machine, the manufacturer designed and built the special work holding fixture.

Better Solutions for Your Metal Working Problems

Whether you require equipment to fit into your present production lines, or need assistance in laying out a new method of processing your part, there is a Barnes Special Machine Tool which produces more and better work at lower costs.

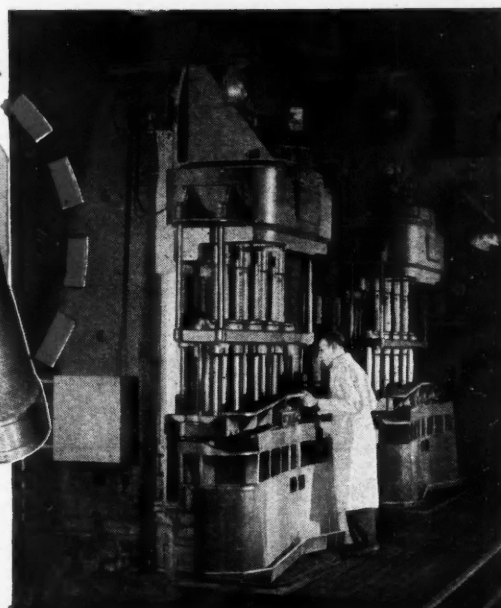
Multiple machining operation, which include high production *drilling, reaming, boring, tapping, chamfering, milling, hollow milling* and *facing*, can, in many instances, be combined in ONE Barnes machine, thus eliminating standard machines doing these individual operations.

If you have metal working problems, Barnes engineers will cooperate with you in designing Special Machine Tools for your



W. F. and JOHN BARNES

312 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



Installation view of two W. F. and John Barnes Vertical Boring Machines for finish boring of cylinder liners in prominent tractor plant.



View of special work holding fixture, manually operated, showing cylinder liners in fixture prior to finish boring operation. This work holding fixture was designed and built by the manufacturer in co-operation with Barnes engineers.

specific needs. Their experience offers higher production with more accurate work, better finishes and less work spoilage.

*What Others Have
Done With Barnes
Special Machine
Tools . . .*



The Barnes "Special Machine Tools" Book shows you how a wide variety of machining problems have been solved by W. F. and John Barnes Company engineers. Complete tooling and production data is given together with other interesting information. Key production personnel can get their free copy when requested on company letterhead. Ask for Book 446.

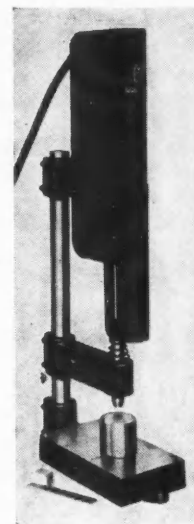
suit a wide range of materials.

The solid carbide blade is held in the head or holder by a wedging device of Super design. This permits the carbide blade to be adjusted for wear and to insure the profitable use of the maximum possible portion of the blade. Simple jigs can be obtained for the sharpening of the carbide blades to suit all types of work.

These cutters will be available in 6 in., 8 in., and 10 in. diameters, in both right-hand and left-hand, as standard tools. Special adaptations of their principles can be worked into special cutters of many sorts.

MEAD SPECIALTIES CO., 4114 N. Knox Ave., Chicago 41, Ill., is introducing a new air power unit known as the impact air hammer. This small machine, weighing 27 lb, is said to be capable of performing a wide variety of operations. The narrow overall width of the machine permits punching holes as close together as 1 3/4 in. on centers.

There is no specific limit to the size of the sheet or number of holes that can be pierced in one operation. A suitable table can be made with a heavy steel plate, 1 in. to 1 1/2 in. in thickness, provided with rows of tapped holes by which the units can be dogged or bolted



Mead air hammer

Why leaders in every field
use **PALNUTS**—



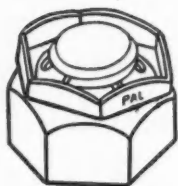
ALWAYS HOLD TIGHT

**EASY AND FAST
TO ASSEMBLE**

LOW IN COST

**WITHSTAND
HIGH TEMPERATURE**

**DO NOT DAMAGE
NUT OR NUT SEAT**



Used as
locknut
on heavier
assemblies



Used alone as self-locking nut
on lighter assemblies.

● Send details of your application for recommendation and free samples. Ask for literature describing Palnut double-locking principle, advantages, types, sizes, etc.

THE PALNUT COMPANY 60 CORDIER ST., IRVINGTON, N. J.

**DOUBLE-
LOCKING**

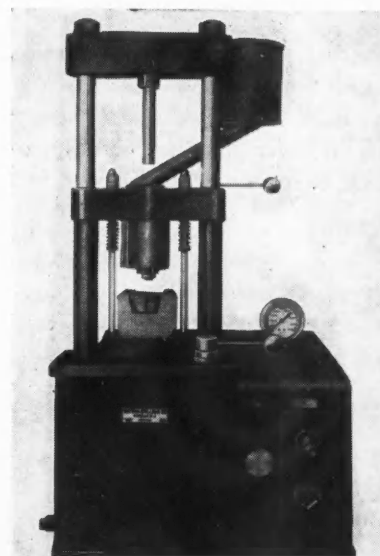
PALNUTS

down in any desired location. Tables up to 8 by 40 ft can be made. If desired, such tables can be provided with a "gate" at one end, so that the punches mounted at that end can be swung out to permit insertion and removal of the work.

For punching operations, it is normally used in conjunction with standard punching units. The machine can be operated in any position, which makes it adaptable to piercing large sheet metal items after forming. The capacity on 100 psi is 3/8 in. hole in .065 cold rolled steel. The ram delivers a blow equivalent to approximately 4000 lb pressure.

WATSON-STILLMAN CO., 109 Aldene Rd., Roselle, N. J., is producing a 1-oz injection molding machine, designed to relieve larger equipment of experimental work and to make molding from small, single-cavity dies more profitable on short runs.

The new W.-S. machine is completely
(Turn to page 106, please)



Watson-Stillman 1-oz injection molding machine

TWO HUNDRED EIGHTY TIMES AROUND THE WORLD PROVES...



Porous Chrome **PISTON RINGS** *better in Every Way*

IT'S ALL HEADLINES ABOUT A-H POROUS CHROME RINGS!

Fleet Operators To Profit By New Development!

Proved By Seven Million Miles Of Road Tests!

Tested In All Types Bus And Truck Engines, All Types Of Service!

Porous Chrome Rings . . .

- . . . Quadrupled Time Between Engine Overhauls
- . . . Reduced Normal Cylinder Wear One-Half
- . . . Lowered Oil Consumption For Longer Period
- . . . Seated Instantly . . . No Break-In Troubles

Porous Chrome Piston Ring Sets For Truck And Bus Engines Ready Now. Call Your American Hammered Jobber.



Chrome piston-rings are an original American Hammered development.

* Van der Horst process

Koppers Company, Inc., American Hammered Piston Ring Division, Baltimore, Maryland

American Hammered Piston Rings

A K O P P E R S P R O D U C T

(Advertisement)

HANGAR FLYING



The Busted Window at 20,000

Kicking windows out of airliners isn't what you'd call approved airborne etiquette. But, not so long ago, Lockheed did just that during flight tests on the *Constellation's* Normalair cabin.

Back in the days when Wiley Post was making his pioneering swipes at the stratosphere, Lockheed engineers, of course, had learned a lot about supercharging cabins doing ground-work (and airwork) on the old Lockheed XC-35, the first plane with a fully pressurized cabin.

From the knowledge thus gained about stressing, sealing and supercharging, the research men then perfected the famous Normalair cabin. Now, while the *Constellation* sleeks along at 20,000 feet, the altitude inside the ship is a mere 8,000.



Lockheed insisted on knowing what would happen to people if pressure went down (which is unlikely, since either of two superchargers can carry the load). So one day, in a carefully planned experiment, they kicked out a window at 20,000, with 44 random-picked, ordinary people aboard. The pressure and the plane descended smoothly, and no serious discomfort turned up.

Q. E. D. If an unknown factor crops up at Lockheed, it doesn't stay unknown long. This kind of efficient curiosity makes for good planes and good hangar flying.

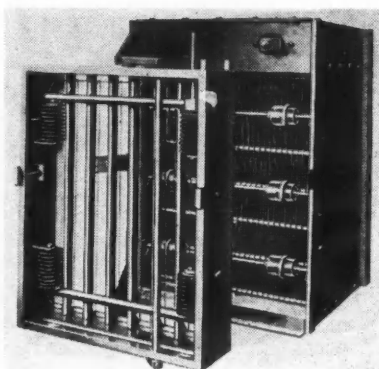
L to L for L

©1946, Lockheed Aircraft Corp., Burbank, Calif.

self-contained, fully hydraulic, and powered with a vane type pump. A micro valve controls pressure steplessly to a maximum of 1200 lb. Positive alignment of nozzle with the sprue opening in the die is provided for through a dowel arrangement. Standard equipment includes thermostatic control of the heating cylinder. An indicating temperature control is among optional equipment available for the machine.

THE Electro-Cell, a unit type electronic air filter with removable collector plate assemblies, is one of the latest type now being manufactured by the American Air Filter Co., Inc., First and Central Ave., Louisville 8, Ky.

The positive and negative collector plates are assembled on cross rods to form horizontal groups which may be readily removed from the filter casing.



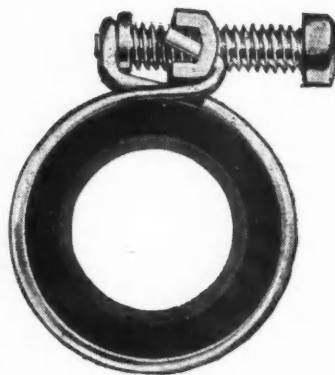
Electro-Cell electronic air filter

By keeping a spare set of plates sufficient for one section for use as a replacement, the length of time the filter is out of service is reduced to a minimum. An automatic washing device has been developed permitting collector plate assemblies to be washed in place for installations where manual washing is not feasible.

Standard sections of the Electro-Cell are 2 ft and 3 ft in width with a capacity of 1000 cfm per unit and range from this minimum to as many sections as are needed for the particular installation. The construction of the filter is such that it eliminates the duplication of top and bottom sections of box-like units when assembled one upon another. This is accomplished by the manufacture of the filter in a variation of heights from a minimum of 27 in. to a maximum standard height of 15 ft by 9 in. increments.

In the larger sizes of the Electro-Cell (6 ft or higher), the ionizers are mounted on a bar hinge which swings clear of duct work or adjacent sections giving full access to collector plates.

ONE new HOSE CLAMP that's different!



ONLY the CENTRAL "360" HAS ALL THESE FEATURES

"By every test 360's the best"

ONLY THE "360" forms a complete circle, with no "blind spot."

ONLY THE "360" has the new "push-pull" power principle.

ONLY THE "360" has such a wide margin of take-up on the screw.

ONLY THE "360" applies pressure all the way around the hose *evenly*.

ONLY THE "360" prevents leakage *from any point* around the hose.

Write today for your **FREE** sample of Central's "360" Wire Hose Clamp and Bulletin Number 4146

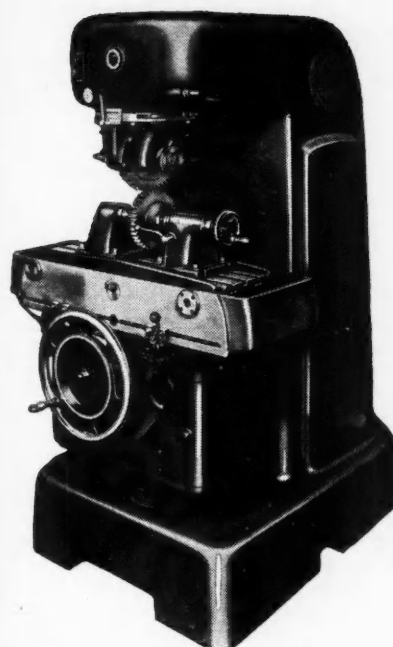
CENTRAL EQUIPMENT CO.
900 S. Wabash Ave., Chicago 6, Ill.

RED RING MACHINES

SHAVE GEARS UP TO 220" P. D.

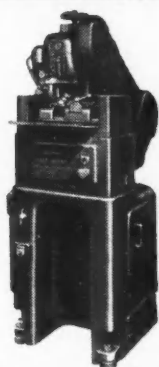
If it's a spur or helical gear of any size up to 220" P. D. there is a Red Ring Machine on which it can be shaved.

Gears up to 36" P. D. may also be shaved to the Elliptoid tooth form on Red Ring Rotary Shaving Machines.

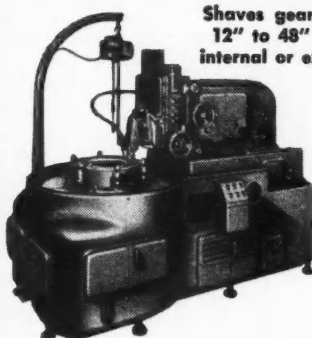


Shaves gears from
1" to 24" P. D.

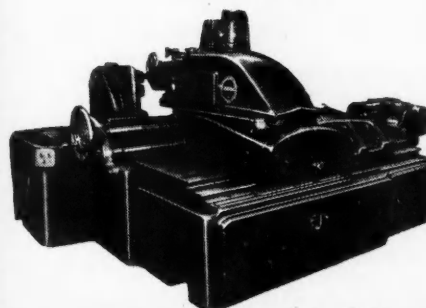
Shaves gears
from
3/16" to 4"
P. D.



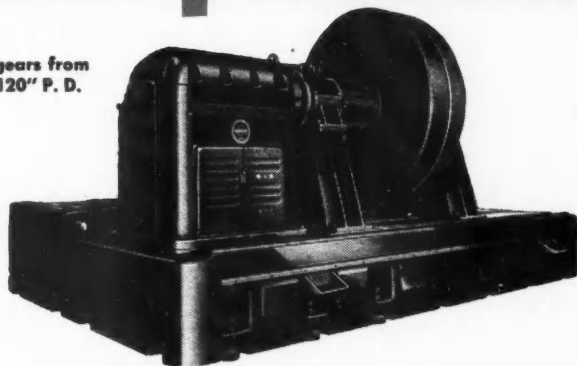
Shaves gears from
12" to 48" P. D.,
internal or external.



Shaves gears from
4" to 48" P. D.



Shaves gears from
24" to 120" P. D.



Shaves internal gears from
3" to 12" P. D.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN

RED RING  PRODUCTS

DETROIT 13, MICH.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

Precision Casting

(Continued from page 23)

for both surface and internal imperfections. Surface quality is checked by Zygo inspection, Fig. 7, this method being used because of the non-magnetic nature of the alloys handled by Haynes. Later the castings go to the X-ray laboratory for 100 per cent X-ray examination.

Now for some comment as to limitations of size and weight and dimensional tolerances within the range of practicability at the present time. Haynes precision castings are made in

a wide range of sizes. For intricate shapes requiring soft metal dies, the maximum size of die is about 10 by 12 by 5 in. If the part is of simple shape, permitting the making of a die from some easily machinable material, larger parts can be produced. While there is practically no minimum weight limit, maximum weight depends upon the method of pouring the metal. Maximum weight for pressure castings, limited by the capacity of the melting furnaces, is presently about five pounds.

Getting to specific design detail the minimum practical wall thickness is about 1/16 in. Assuming that the form of the casting lends itself to thin edges the present minimum edge thickness ranges from 0.012 to 0.015 in. Generally, a small diameter, shallow hole — 1/4 in. diameter, 1/2 in. deep—can be held to a tolerance of plus or minus 0.003 in. both for size and location. Although the tolerances in a specific case depend upon the size and contour of the work, generally it is possible to hold 0.005 to 0.040 in. per inch of dimension on the part "as cast." Where surfaces must be finished by machining or grinding an allowance of 0.015 to 0.040 in. "as-cast" is sufficient. The yield of good castings is directly related to the tolerances specified.

Specify **ROCKFORD** — OVER-CENTER — for **CLUTCHES**

EASY OPERATION

HIGH TORQUE

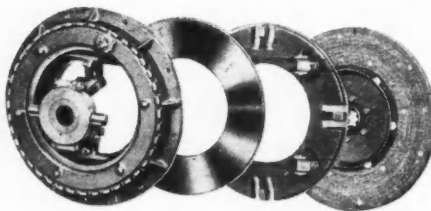
POSITIVE ENGAGEMENT

LARGE DRIVING AREA *

SMOOTH RUNNING

INFREQUENT ADJUSTMENT

MINIMUM INERTIA



* The pressure plates in ROCKFORD Over-Center CLUTCHES have large area, accurately flat-ground surfaces for maximum contact with the facing material. Special alloy iron is used to withstand shock and heat strains. Provision is made for multiple driving, from the back plate. Have hardened steel bearing inserts, where the roller cams operate. Include these ROCKFORD advantages in your designs.

SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning post-war products.



ROCKFORD CLUTCH DIVISION BORG-WARNER
315 Catherine Street, Rockford, Illinois, U.S.A.



Sheet Metal Conveyor System Installed

(Continued from page 35)

wear. Air nozzles on the routers throw chips against a shield and the chips fall onto a belt conveyor which deposits them into a scrap truck.

The router templates are removed at the third from the last station and placed on an overhead conveyor which returns the templates to the applying station. Both drill and router templates are conveyed from the unload stations to the template applying stations by an overhead monorail which operates automatically. At the final two stations, the parts are removed from the conveyor and placed on roller conveyors which convey the parts to the deburring rolls, inspection, and numbering.

The conveyor moves the parts one station closer completion at 15-minute intervals by moving 14 1/2 ft at a speed of 30 fpm. To warn workers a horn is blown before the conveyor moves.

Before the installation of the conveyor only 20 tables of parts per 10-hour shift were being produced with 41 employees. The day after the conveyor was in operation 38 tables of parts were produced with 26 employees, amounting to a saving of 39,000 man-hours per year.

Leasing of Surplus Transport Aircraft Discontinued

The leasing of surplus transport aircraft will be discontinued effective July 1, 1946, according to the War Assets Administration. This will not affect leases now in effect or under negotiation.

In addition to outright sales, transports have been leased in the past for a term of five years, when requested. At the end of five years the planes are to be returned to the Government. The War Assets Administration stated that this arrangement was originally made in order to expedite the disposal of surplus transports and to make them more widely available for civil use. Over 250 leases are now in effect.